MVS/ESA HCD and Dynamic I/O Reconfiguration Primer

February 1996
Take Note!

Before using this information and the product it supports, be sure to read the general information under “Special Notices” on page xix.

Second Edition (February 1996)

This edition applies to MVS/ESA System Product JES2 Version 5 Release 2, Program Number 5695-068, and MVS/ESA System Product JES3 Version 5 Release 2.1, Program Number 5695-069.

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Abstract

This document describes the Hardware Configuration Definition (HCD) component of MVS/ESA System Product Version 5 Release 2 and the Dynamic I/O Reconfiguration function as it relates to HCD. It contains detailed descriptions of HCD and its dialogs, extensive examples that illustrate the definition of many common I/O configurations, and recommendations on the effective use of HCD. This document is intended for system programmers and administrators responsible for defining and activating hardware changes to their S/390 or ES/9000 systems, and for the IBM representatives who need this information. General knowledge of MVS and IOCP is assumed.

Topics contained in this document include:

- HCD concepts
- IODF considerations
- Common definition tasks
- ESCON CTC recommendations
- HCD Migration recommendations
- MVS IPL considerations
- Dynamic I/O reconfiguration
- HCD and the sysplex
- HCD and ESCON Manager
- HCD customization
- HCD questions and answers

(293 pages)
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Special Notices

This publication is intended to help system programmers and administrators use HCD to define and activate their I/O configurations. The information in this publication is not intended as the specification of any programming interfaces that are provided by MVS/ESA System Product Version 5 Release 2. See the PUBLICATIONS section of the IBM Programming Announcement for MVS/ESA System Product Version 5 Release 2 for more information about what publications are considered to be product documentation.

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Preface

This document describes the Hardware Configuration Definition (HCD) component of MVS/ESA System Product Version 5 Release 2 and the Dynamic I/O Reconfiguration function as it relates to HCD. It contains detailed descriptions of HCD and its dialogs, extensive examples that illustrate the definition of many common I/O configurations, and recommendations on the effective use of HCD. This document is intended for system programmers and administrators responsible for defining and activating hardware changes to their S/390 or ES/9000 systems, and for the IBM representatives who need this information. General knowledge of MVS and IOCP is assumed.

How This Document Is Organized

The document is organized as follows:

- Chapter 1, “Introduction”
- Chapter 2, “Hardware Configuration Definition Concepts”
  This chapter provides an overview of HCD concepts and of the rationale for introducing a new method of defining hardware configurations.
- Chapter 3, “IODF Considerations”
  This chapter describes the Input/Output Definition File (IODF), which is the repository for the hardware and software definitions used by HCD and Dynamic I/O Reconfiguration Management.
- Chapter 4, “Common Tasks”
  This chapter describes the common I/O definition tasks. It describes also some common configuration scenarios and gives step-by-step instructions on how to perform specific tasks.
- Chapter 5, “ESCON CTC Definitions”
  This chapter describes how to define ESCON CTC configurations using HCD.
- Chapter 6, “Migration”
  This chapter describes how to migrate existing MVSCP and IOCP definitions to an IODF. It also describes how to migrate a switch configuration.
- Chapter 7, “MVS/ESA IPL Procedure”
  This chapter shows how an IPL from an IODF differs from that in previous systems.
- Chapter 8, “Dynamic I/O Reconfiguration”
  This chapter is an introduction to Dynamic I/O Reconfiguration Management and shows how it relates to HCD.
- Chapter 9, “HCD in a Sysplex Environment”
  This chapter shows how to plan for and configure S/390 microprocessors and ES/9000 processors within a parallel sysplex, including coupling facility channel connections.
- Chapter 10, “HCD and ESCON Manager Relationship”
This chapter discusses ESCON concepts in relation to HCD and specifically the inter-relationship between HCD and the ESCON manager (ESCM).

- Chapter 11, “HCD Customization”
  This chapter shows how to customize HCD.
- Chapter 12, “Other Considerations”
  This chapter documents additional considerations you should be aware of.
- Chapter 13, “HCD: Questions and Answers”
  This chapter presents answers to commonly asked questions about HCD and Dynamic I/O Reconfiguration Management.
- Appendix A, “HCD Sample CLIST”
  This appendix describes the two CLISTs that are provided as part of HCD and that can be tailored for installation needs.

Related Publications

The publications listed in this section are considered particularly suitable for a more detailed discussion of the topics covered in this document.

- MVS/ESA Hardware Configuration Definition: Scenarios, SC33-6491
- MVS/ESA Hardware Configuration Definition: Messages, GC33-6467
- MVS/ESA Device Validation Support, GC28-1447
- MVS/ESA SP V5 System Commands, GC28-1442
- MVS/ESA SP V5 Initialization and Tuning Guide, SC28-1451
- MVS/ESA SP V5 Initialization and Tuning Reference, SC28-1452
- MVS/ESA SP V5 Conversion Notebook, GC28-1436
- MVS/ESA SP V5 Hardware Configuration Definition: Planning, GC28-1445
- Input/Output Program User’s Guide and ESCON Channel-to-Channel Reference, GC38-0401
- Using the Enterprise Systems Connection Manager, SC23-0425

International Technical Support Organization Publications

- IBM 3495 Implementation Primer for MVS, GG24-3987

A complete list of International Technical Support Organization publications, known as redbooks, with a brief description of each, may be found in:

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Acknowledgments

This publication is the result of two residencies conducted at the International Technical Support Organization center in Poughkeepsie. The advisor for the first edition of this book was:

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Special thanks to John Snowden of the Washington Systems Center for his generous contribution of time and material.
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Special thanks to:

• Ken Trowell of IBM Australia for his generous contribution of material, and for reviewing the book.

• Luiz Fadel of IBM Brazil for his help in preparing parts of the book.

• Friedrich Beichter of IBM Entwicklung GmbH, Boeblingen, Germany for his help in reviewing the book.

• Annelie Graf-Killes of IBM Entwicklung GmbH, Boeblingen, Germany for her help in reviewing the book.
Chapter 1. Introduction

Hardware Configuration Definition (HCD) provides an interactive interface that allows you to define the hardware configuration to both the channel subsystem and the operating system. Before HCD was available, you had to use IOCP to define the hardware to the channel subsystem and the MVS Configuration Program (MVSCP) to define the hardware to the MVS operating system.

HCD combined with the Dynamic I/O Reconfiguration Management function allows you to make changes to either the hardware or software configurations without the need of a Power-on Reset (POR) or an IPL. This greatly enhances overall system availability by making possible the elimination of scheduled outages that were previously necessary when parts of the configuration were changed.

Because the HCD method of defining configurations is new, its unfamiliarity may cause some initial difficulty in using the dialog. The purpose of this manual is to provide introductory information for HCD and to show step-by-step how to perform common HCD tasks.

HCD is a very flexible and powerful tool that allows you many ways to accomplish each task. One of the purposes of this manual is to show a variety of ways for performing these tasks, along with a discussion of the pros and cons of each approach. For example, Chapter 4, “Common Tasks” on page 27 describes individual tasks that can be performed with HCD as well as showing how to define a configuration using a hierarchical approach (define a CHPID, then the attached control units, then the devices).

It is not necessary to read this book from start to finish. Instead, you can skip to the section that describes the task you want to accomplish. Because we expect that most readers already have configurations defined in other forms (such as MVSCP and IOCP decks), the most popular starting point is Chapter 6, “Migration” on page 181. However, if you have the time, read Chapter 4, “Common Tasks” on page 27 to become familiar with several typical definition tasks. It also provides you with a number of hints and tips that allow you to define your configuration in a more efficient way.

And, once you have used the graphical display function, you will use it whenever you have made any configuration changes. Also, if you see any indication of a definition problem and you don’t understand it, display the affected configuration portion, and you will immediately understand the cause of the problem.
Chapter 2. Hardware Configuration Definition Concepts

The MVS/ESA Hardware Configuration Definition (HCD) program is used to define hardware and software configurations for S/390 and S/370 systems. It replaces the MVS Configuration Program (MVSCP) for defining operating system configuration information (UCBs, EDTs, and NIPCONs). Also, it is used instead of the I/O Configuration Program (IOCP) for defining the hardware configuration. IOCP is still called to write the IOCDS, but its input is created automatically by HCD. Additionally, changing hardware definitions dynamically using Dynamic I/O Reconfiguration Management requires that the configurations have been defined by HCD.

This chapter covers the following topics:

• What IOCP and MVSCP do
• What HCD does
• How to implement HCD
• What UIMs and Processor modules are for
• How all this makes Dynamic I/O Reconfiguration Management possible

2.1 IOCP and MVSCP

IOCP is used to define the hardware to the Channel Subsystem (CSS), and the MVS Configuration Program (MVSCP) is used to define the hardware to the MVS operating system. The IOCP updates the Input/Output Configuration data set (IOCDS) that resides in the Hardware Support Processor. This information is loaded into the Hardware System Area during Power-on Reset (POR). If the configuration is changed, it is necessary to write a new IOCDS using IOCP and to load it into the Hardware System Area with a POR.

MVSCP creates the control information (such as UCBs, EDTs, and NIPCONs) needed by MVS to describe the hardware configuration and stores this information in the SYS1.NUCLEUS data set. The nucleus information is loaded at IPL time into storage. If a change is made to the I/O configuration, it is necessary to IPL in order to make the information available to MVS.

MVSCP and IOCP are independent programs that run separately. There is no checking done prior IPL to ensure that the MVSCP output matches the configurations in the IOCDS. Even if the definitions of both programs are not identical, it is possible for an IPL to be successful, if the devices needed to start the system are included in both. It is therefore possible that discrepancies would be noted only after the system had been running for some time. Such a discovery could come at a very inconvenient time.

Because IOCP and MVSCP share some macro instructions, it is possible under certain conditions to have a combined input deck for both programs. There are restrictions that often make this impossible, however. Furthermore, some parameters on IOCP macros are without meaning to IOCP (the UNIT= parameter on the CNTLUNIT macro, for example), so that definition checking for syntactical correctness is incomplete.
2.2 What HCD Does

HCD is an ISPF application that rationalizes and streamlines the hardware definition process as follows:

- It combines hardware (IOCP) and software (MVSCP) definitions into a single process.
- It allows multiple software and processor configurations to be defined in a single database.
- It creates a single definition for each physical control unit and device.
- It provides immediate online validation of configuration data.
- It contains extensive online help and prompt facilities.
- It provides dynamic I/O reconfiguration support.

By combining both hardware and software definitions in a single operation, HCD reduces the possibility that the two are not equivalent. Since there are still two sets of data used when initializing the hardware and the software, it is not possible to eliminate the possibility of a discrepancy altogether. However, MVS provides a mechanism whereby a discrepancy is detected immediately at IPL and the operator is notified.

HCD keeps its definitions in a separate database, called an I/O definition file (IODF). A single IODF can contain definitions for several processors (or LPARs) and several MVS or VM systems. The IOCDS containing the channel subsystem definitions for the processor is created from the IODF using HCD. MVS/ESA SP Version 4 and later versions read the configuration information directly from the IODF during IPL.

2.3 How to Implement HCD

HCD is implemented as an object-action application. This means that the HCD user selects an object and then performs an action on that object. HCD objects are kept in a special database called the I/O definition file (IODF).

An object can have a number of characteristics. Some of the characteristics are important for the software definition and some for the hardware definition, while some are important for both definitions. If you want to change a hardware characteristic definition of an object, you select the object and make the change. If the characteristic you changed was also important to the software (for example, you change the device type), the change is automatically reflected to the software. There is no need to make the change twice to have it both in the hardware and software.

HCD is implemented as an ISPF dialog under TSO/E. HCD provides extensive cursor-sensitive help and prompting facilities. Data entered through the dialog is checked for syntactical and semantic correctness when it is entered. Data that has been correctly entered is placed in the work IODF.

When a configuration is complete, a production IODF is created from the work IODF. The production IODF is used by MVS to load the configuration data at IPL time and to dynamically update the configuration by means of Dynamic I/O Reconfiguration Management. It is also used as input to IOCP when writing the IOCDS. The production IODF cannot be updated (read-only). This ensures that
the data in the production IODF used at IPL remains the same while that system is running. See Chapter 3, “IODF Considerations” on page 7 for detailed information on the various IODF types.

2.4 Unit Information Modules and Processor Modules

The Unit Information Modules (UIMs) contain device-dependent information such as parameters and features of the device. UIMs are used by HCD to validate device entries. UIMs are used at IPL time to help build the UCB control blocks. Therefore, the UIMs have to reside in SYS1.NUCLEUS. When you receive a new IBM device type (not additional devices) or a new feature for an already existing device, a new UIM may also be required. The UIM can be delivered as a Program Temporary Fix (PTF) to be installed on the MVS system. When you enter the HCD dialog, the UIMs are loaded for HCD during the initialization period. Afterwards, they are available for HCD to use. For non-IBM equipment, some manufacturers supply UIMs, but if none are supplied it is possible to write your own. More information on writing your own can be found in MVS/ESA Device Validation Support. If you do not wish to write your own UIM, you can define the device as a DUMMY device. Likewise, you can define a control unit for which no UIM exists, as a control unit type “NOCHECK.” See 12.2, “Defining OEM Equipment” on page 275 for more information.

The processor also has a module that describes the characteristics of the processor (for example, number of channel paths, valid channel path types). This module can describe a group of processors/models that have similar characteristics. These modules are provided as part of HCD, but only for IBM processors. If you have to define an OEM processor, make sure, the processor supplier has provided you with a corresponding processor support module.

2.5 How All This Makes Dynamic I/O Reconfiguration Possible

The ability of HCD to provide related hardware and software I/O definitions and to detect when they are not related is essential for Dynamic I/O Reconfiguration Management. Dynamic I/O Reconfiguration Management is the ability to change both the hardware and software definitions without doing either an IPL or a POR. In order to make such dynamic changes to the system, it is necessary that the configuration definitions both before and after the change be known to HCD.

It would have been difficult to implement a dynamic change mechanism using MVSCP and IOCP, because they are batch programs that run once and produce separate definition data. HCD, on the other hand, produces the related definition data and is also used to update the Channel Subsystem and Operating System with dynamic changes.

The advantages of HCD over MVSCP/IOCP are as follows:

- Hardware and software definitions are checked for correctness at definition time, not at execution (IPL or POR) time.
- Hardware and software definitions are checked for consistency with each other and are kept in a common database.
- Objects (such as I/O devices) have to be defined only once, thus eliminating the chance that hardware and software definitions would get out of sync. If you change the definition of an object, you change both its hardware and software definition at the same time.
Data consistency makes Dynamic I/O Reconfiguration Management possible.
Chapter 3. IODF Considerations

The I/O definition file (IODF) is a VSAM linear data set that is built and maintained by HCD. It is the configuration definition repository for:

- Processors
  - Logical Partitions
  - Channel paths
- Switches
  - Switch configurations
- Control units
- I/O devices
- Operating systems
  - EDTs
  - Esoterics
  - Consoles (NIPCONS for MVS)

There are two types of IODF data set, Work IODF and Production IODF.

A work IODF allows the user to create a new I/O configuration definition or modify an existing one. You can have multiple work IODFs, each with a unique name.

A production IODF is the data set used to obtain the definitions needed to run the system. For example, MVS/ESA Version 5 IPLs from a production IODF, and IOCP obtains the information for creating an IOCDS from a production IODF. It is not possible to perform either of these tasks from a work IODF.

The user can create multiple production IODFs, but only the one selected at IPL or dynamic activation becomes the active production IODF.

A production IODF is a read-only data set, which preserves the integrity of the IODF, with one exception. If you download an IOCDS, usage information will be written to the production IODF and can be viewed on the IOCDS List panel (from HCD option 2.2).

This chapter focuses on IODF considerations with special attention to:

- IODF naming conventions
- Work IODF
- Production IODF
- Determining the nature of an IODF
- IODF sizing
- IODF placement
- Catalog considerations
- IODF backup
- Configurations within an IODF
- Maintaining a switch configuration within an IODF
3.1 IODF Naming Conventions

When creating a work IODF, the IODF name must be enclosed in single quotes. If you do not enclose the IODF name in quotes, HCD uses the TSO user prefix, if one is specified, as the first-level qualifier of the IODF name. Otherwise, HCD prefixes the IODF name with your userid.

All work IODF names must conform to the following convention:

′hhhhhhhh.IODFxx.yyyyyyy.yyyyyyy′

Where:

| hhhhhhh  | High level qualifier - up to eight characters |
| xx       | Hexadecimal number in the range of 00 through FF |
| yyyyyyy  | Optional qualifiers - up to eight characters each |

You can use any number of optional qualifiers, but do not make the name longer than 35 characters, because additional qualifiers are appended to the IODF name for the activity log (ACTLOG), and the message log (MSGLOG).

HCD provides the user with considerable flexibility in the choice of work IODF names. It is, however, recommended that users be more stringent in their naming conventions. It is recommended that users follow the following convention when choosing a name for an IODF:

′hhhhhhhh.IODFxx.WORK’

In this manner, the user can easily ascertain the nature of the IODF.

The naming convention of the production IODF is more restrictive. If the IODF is to be used for IPL and dynamic activation, the production IODF must have the following format:

′hhhhhhhh.IODFxx’

Where hhhhhhh is the high-level qualifier and xx is the IODF suffix.

As mentioned previously, the production IODF is an IPLable image of the work IODF. The following naming convention is a good way to relate the current production IODF to its work IODF, and is easily extendable as new IODF versions are created:

ACTIVE PRODUCTION IODF ′hhhhhhhh.IODF30’
SUBSEQUENT WORK IODF ′hhhhhhhh.IODF31.WORK’
RESULTING NEW PRODUCTION IODF ′hhhhhhhh.IODF31’

You should use some care in choosing a high-level qualifier. This is of particular importance when defining systems within a sysplex. Sysplex-wide activate requires that all currently active IODFs have the same HLQ as the IODF to be activated. If you have more than one MVS system using a single IODF, it is best not to use a high-level qualifier, such as SYS1, that causes the IODF to be
cataloged in the master catalog. This is because an IODF should be cataloged on each system that will use it. There are Dynamic I/O Reconfiguration Management restrictions on a system using an uncataloged IODF. Since the IODF is a VSAM data set, it can be in only one catalog, so the best solution is to catalog it in a user catalog with alias pointers in all the master catalogs.

In preparation for dynamic activation of a new IODF, HCD compares the source IODF data set name to the target IODF data set name. For dynamic activation to take place, MVS requires that the high-level qualifier of the currently active IODF be identical to the high-level qualifier of the IODF being activated. If the high-level qualifiers do not match, the activation is rejected and message CBDA836I is issued:

```
IODF data set name HILEVEL.IODF00 is not comparable to source IODF data set name SYS4.IODF00. Activation is rejected.
```

In the case of ESCON Director switch activation, the high-level qualifier does not have to be the same as the active production IODF.

### 3.2 Work IODF

When starting the HCD dialog for the first time, you will need to supply a work IODF name. On the HCD Primary menu select an action, and in the I/O Definition file field specify a suitable work IODF name enclosed in quotes. In this example we will use SYS4.IODF00.WORK.

HCD recognizes that this is a new data set name and displays the panel shown in Figure 1. Specify the volume you wish the IODF to be allocated to (this field is promptable) and press F4 for a list of volumes. If you are working within an SMS managed environment, the volume serial number is not required.

Specify whether you want activity logging to be enabled. If you opt for this function, then the activity log will be displayed as the last panel when exiting following an update to the IODF.

```
Create Work I/O Definition File

CBDDPUT10

The specified I/O definition file does not exist. To create a new file, specify the following values.

IODF name . . . . . . 'SYS4.IODF00.WORK'
Volume serial number . . . . . .
Space allocation . . . 1024 (Number of 4K blocks)
Activity logging . . . Yes (Yes or No)
```

*Figure 1. Specifying a Work IODF*
At this time you must also specify the size of the new work IODF in terms of the number of 4KB blocks (1KB = 1024 bytes). Pressing F1 (help) with the cursor on this field provides some guidance. In general, accepting the default value of 1024 allows for definition of some 4000 devices. There is more information on how to calculate the size of the data set in 3.5, "IODF Size" on page 11. The Help Panel also suggests that if you run out of space, you should copy the data set into a larger data set. See 3.6, "Enlarging an IODF" on page 13 for instructions how to enlarge the size of an existing IODF.

When all fields are correctly completed, pressing Enter shows the next panel and below this should appear a message to confirm that the new work IODF data set has been created.

If you are attempting to update a production IODF, you are prompted to create a work IODF based on the contents of the production IODF. The sequence is the same as creating a new work IODF from the point of entering the space allocation and volume placement.

### 3.3 Production IODF

HCD performs a set of validations when the user builds a production IODF. The definitions in the IODF are validated for completeness and consistency. The production IODF may be used for several actions:

- Initial Program Load (IPL)
- Dynamic activation
- IOCDS download
- Build IOCP data set
- Switch activation
- JES3 Initialization stream creation

The production IODF is a copy of the work IODF, but its records are arranged differently to optimize loading at IPL. The production IODF is read during IPL to allow for the dynamic creation of UCBs, EDTs, and NIPCONs. The IODF records are aligned on a 4KB block boundary and rearranged in a format that can be processed by IPL.

A production IODF must be fully contained in its primary allocation. HCD provides a utility function that creates a production IODF from a work IODF. The production IODF can be created through the HCD panels beginning with the Activate or Process Configuration Data option from the HCD Primary Menu panel. When creating a production IODF, you must specify a new data set. The actual creation of a production IODF is covered in more depth in 4.6.1, "Creating a Production IODF" on page 96. HCD provides the customer with the ability to create a production IODF in batch mode. The batch job frees you to perform other tasks while the production IODF is being created. *MVS/ESA Hardware Configuration Definition: User’s Guide* provides a sample batch job for creating a production IODF.
3.4 Determining the Currently Active IODF

There are two ways to determine the currently active IODF.

The DISPLAY IOS,CONFIG command produces the following output:

D IOS,CONFIG
IOS5061 14.02.43 I/O CONFIG DATA 047
ACTIVE IODF DATA SET = SYS4.IODF00
CONFIGURATION ID = BLUESYS1 EDT ID = 01
TOKEN: PROCESSOR DATE TIME DESCRIPTION
SOURCE: P201 95-03-22 16:14:01 SYS4 IODF00

Alternatively, from the HCD Primary Menu, select **Activate or Process Configuration data** followed by **View Active Configuration** to display this panel:

---

3.5 IODF Size

The default size for IODF data set allocation is 1024 4KB blocks. It is advised that this value is accepted initially. Should it prove to be insufficient it is possible to later copy the IODF to a new, larger data set. This will be discussed later.

The limit on the number of devices that you can define per processor is based on the hardware architecture limit for each processor. Furthermore, the size of your IODF determines how many objects can be defined.

Table 1 provides approximate sizes for the various elements of an IODF and can be used to make a rough calculation of the storage you need:
The result is in bytes. You must divide that result by 4096 to determine the number of blocks to allocate to your IODF.

As a rule of thumb, if you want to add about 1000 devices to your IODF, you have to allocate an IODF of 1MB, or 256 4KB blocks.

When allocating a new work IODF, you should consider the number of additions that you plan for your configuration, and include additional space accordingly.

You can determine the current allocation of your IODF as follows:

1. Select **Maintain I/O definition files** from the HCD Primary Menu panel.

2. Select **View I/O definition file information** from the Maintain I/O Definition Files panel shown in Figure 2.

<table>
<thead>
<tr>
<th>Element</th>
<th>Size (in bytes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Information</td>
<td>4096</td>
</tr>
<tr>
<td>Per processor (including channel paths)</td>
<td>36864</td>
</tr>
<tr>
<td>Control units</td>
<td>128+(A×256)</td>
</tr>
<tr>
<td>Devices</td>
<td>128+(B×128)</td>
</tr>
<tr>
<td>Operating Systems (with devices)</td>
<td>256+(C×256)</td>
</tr>
<tr>
<td>OS device extensions (for MVS-user/VM-system parameter)</td>
<td>(D×256)</td>
</tr>
<tr>
<td>OS generics (MVS only)</td>
<td>(E×64)+(F×64)</td>
</tr>
<tr>
<td>OS EDT (MVS only)</td>
<td>128+(G×64)+(H×64)+(J×64)</td>
</tr>
<tr>
<td>NIPCONs</td>
<td>K×64</td>
</tr>
<tr>
<td>Location/description data</td>
<td>L×64</td>
</tr>
<tr>
<td>Switch</td>
<td>128+8192</td>
</tr>
<tr>
<td>Switch configuration</td>
<td>128+(M×64)</td>
</tr>
</tbody>
</table>

**Note:**

- A = No. of processors the control unit is attached to
- B = No. of processors the device is known to
- C = No. of devices defined to the OS
- D = No. of OS devices defined with extension data.
- In case of doubt, assume D=C for VM and D=0 for MVS
- E = No. of generics defined to the OS
- F = Total No. of devices assigned to all generics of OS
- G = No. of generics updated by the EDT
- H = No. of esoterics
- J = Total No. of devices assigned to all esoterics of an EDT
- K = No. of NIPCONs
- L = No. of records defined with serial number, description data (see channel path, processor, control unit, device, and switch definitions.)
- M = No. of ports used in a switch configuration
Maintain I/O Definition Files

Select one of the following tasks.

1. Delete I/O definition file
2. Copy I/O definition file
3. View I/O definition file information
4. Export I/O definition file
5. Import I/O definition file
6. Upgrade I/O definition file to new format

Figure 2. Select ‘View I/O Definition File Information’

3. HCD displays the space allocation of the IODF (see Figure 3). This assists you in determining the space requirements for any new work IODF that you may allocate.

Another way to find out the IODF type is to go to any list panel and type in SHOWIODEF in the command line. You will see the same panel as shown in Figure 3.

3.6 Enlarging an IODF

It might happen that you face a short-on-storage condition for the work IODF you are currently updating. This is indicated by message CBDA563I, saying that there is no more room available in the IODF:

```
Space exhausted in work IODF SYS4.IODF00.WORK.
```

HCD does not permit extending the IODF automatically. You must copy the IODF into a larger data set and then continue with the new IODF. Proceed as follows:

1. Determine the allocated or used size of the IODF.
See 3.5, “IODF Size” on page 11 for more details on how to do that.

2. Copy the content of the IODF into the new IODF. Refer to steps 1 and 2 in 3.9, “Production IODF Backup” on page 16.

3. Specify the name of the new IODF and whether or not you want activity logging enabled. Most likely, the new IODF does not exist; therefore, you are prompted to specify the volume containing the new IODF and its size. Here you specify a reasonable size taking the size of the old IODF into consideration.

Note that the “space allocation” field has a default value which is the allocated size of the source IODF.

4. Optionally, you can delete the old IODF.

### 3.7 IODF Placement

The production IODF to be used during IPL processing must be placed on the IODF device. The IODF device is pointed to by the load parm (L2) value on the OPRCTL/SYSCTL frame on the ES/9000 hardware system console, or from the Hardware Management Console profile (image or load) for the 967x S/390 microprocessor cluster.

The format of the load parameter field is:

```
1 4 5 6 7 8
```

<table>
<thead>
<tr>
<th>IODF DASD</th>
<th>LOADxx</th>
<th>PROMPT FEAT.</th>
<th>ALT NUCx</th>
</tr>
</thead>
<tbody>
<tr>
<td>IODF device suffix</td>
<td>prompt nucleus number</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

By using only one IODF volume, it is possible to keep the load parameter value on the OPRCTL/SYSCTL field constant, which, in turn, ensures that the creation of a new production IODF has little or no impact on the IPL.

The production IODF must reside on a DASD volume that is accessible from all systems whose configuration is supported by that IODF. If not all systems can access the IODF volume, then a copy can be made available to the other systems. Although it is possible to use DFDSS DUP or IDCAMS EXPORT to transmit the IODF to other systems, the recommended method is the HCD Transport facility.

(see 3.16, “Transporting an IODF” on page 22 for more information)

In an SMS environment, care should be taken to ensure that either:

- The production IODF data set name is not managed by SMS. You can then specify the IODF volume serial number when creating a production IODF.
- The ACS routines are set up to automatically place the production IODFs on the IODF volume.

Care must also be taken in the placement of the LOADxx member. A detailed description of the LOADxx member and its relationship to the production IODF is presented in Chapter 7, “MVS/ESA IPL Procedure.”
3.8 Catalog Considerations

In a multi-system environment, a single IODF can define several processor (with or without partitions) and software configurations. Because an IODF is a VSAM data set, it can be cataloged in only one catalog. Therefore, if you wish to share an IODF data set among multiple systems and each system is using a separate master catalog, you must define (in the master catalog of each system) an alias that relates to the user catalog on DASD that is shared among the systems.

Define aliases and the user catalog before using HCD to define IODF data sets. Figure 4 shows the recommended catalog structure.

---

**Figure 4. Recommended IODF Catalog Structure in a Multi-System Environment**

The following is an example of an implementation of a shared IODF:

1. Choose a DASD volume that is online to all systems:
   - VOL=SER=IODFVL

2. On IODFVL, create a catalog called CATALOG.IODF
   - DEFINE CATALOG.IODF UCAT ...

3. Create an entry for this catalog in the master catalogs (using the IDCAMS IMPORT command) of the other MVS systems that share the IODFs.
   - IMPORT CONNECT((NAME(CATALOG.IODF ....

4. Define an alias SYS4 in each of the master catalogs pointing to CATALOG.IODF. The CATALOG.IODF is a user catalog known to the master catalogs of all the MVS systems. Any SYS4 data sets are cataloged for all the systems. (SYS4 is just an example here of the high-level qualifier of an IODF data set name.)
- DEFINE ALIAS (NAME(SYS4) RELATE(CATALOG.IODF)) CAT(all mastercats)

5. Create an IODF called SYS4.IODFx and place it on IODFVL.

This procedure allows you to update the IODF, IPL, and perform dynamic I/O reconfiguration on any of the systems using the same IODFs. The resulting IODF, as long as it is allocated on the IODF volume (IODFVL), is cataloged and accessible from the other systems.

If you follow the above procedure, you cannot use SYS1 as the IODF high-level qualifier in a multi-system environment where each image is using a separate master catalog and SYSRES volume.

HCD ensures that multiple reads, but only a single update at a time, is possible to an IODF data set.

3.9 Production IODF Backup

It is suggested that you maintain a backup copy of your production IODF on a separate volume that is accessible to all systems that will be sharing the backup. When the primary IODF volume is inaccessible or the IODF itself is corrupted, the system can be IPLed through a backup IODF on the alternate IODF volume.

The following procedure shows how to use the HCD panels to copy the IODF to another volume using the HCD COPY function. HCD uses the normal catalog process to catalog this backup copy of the new production IODF.

1. Select **Maintain I/O Definition files** from the HCD Primary Menu panel.

2. Select **Copy I/O definition file** from the Maintain I/O Definition Files panel (see Figure 5).

   ![Figure 5. Select 'Copy I/O Definition File'](image)

3. Specify the name of the backup IODF (see Figure 6).

   **Note:** It is recommended that you choose an alternate high level qualifier for your backup IODF since a lost IODF volume generally implies a lost IODF catalog. This high level qualifier can be cataloged in either the master catalog or in an alternate user catalog.
4. Specify the alternate volume on which you want the backup IODF to be placed (see Figure 7).

5. Once the IODF has been copied to the alternate volume, message CBDA452I is displayed:

   IODF SYS4.IODF00 copied to IODF SY5.SYS..IODF00.

Alternatively, sample jobs are provided in SYS1.SAMPLIB members CBDSALIO and CBDSCPIO to initialize new IODFs on a new volume and copy the source IODF to the new target IODF on the volume of your choice. These jobs invoke the copy IODF HCD utility function.

Now we have to tell MVS how to locate the IODF. SYSn.IPLPARM is a partitioned data set that contains LOADxx members that point to I/O definition files (IODFs) that reside on the same volume as SYSn.IPLPARM. In order to IPL from the alternate IODF, a LOADxx member must be created to point to the backup IODF, as follows:

1. Place a SYSn.IPLPARM data set on the alternate IODF volume.
2. Create (or copy) a LOADxx member in SYSn.IPLPARM.
3. Update LOADxx to reflect the backup IODF high level qualifier and suffix.

**Note:** If you do not specify the high-level qualifier of the IODF in the LOADxx member in IPLPARM, the system assumes that the IODF high-level qualifier is SYSn (where “n” is a numeric character between 0 and 9).
3.10 I/O Configuration Backup

For each ES/9000 processor in your IODF (that is, for each IOCDS representing the currently active configuration), you should maintain a backup copy of your IOCP input source on tape, for use by the Stand-alone IOCP program, in case the IOCDS data is lost. You should also maintain a backup of the IOCP input data set on diskette if you have a single 9672 processor, or one or more 9674 processors without a 9672 processor.

The panel flow to create a backup copy of the IOCP input source is covered in 4.6.3, “Creating an IOCP Input Data Set” on page 103.

3.11 IODF Requirements for Dynamic Reconfiguration

The MVS/ESA ACTIVATE process requires access not only to the new IODF but also to the currently active one. For this reason, if you intend to make dynamic I/O reconfiguration changes using ACTIVATE, you must ensure that the active production IODF is not deleted. It is possible to recreate the active production IODF from a backup.

For dynamic changes to be allowed, HCD requires that the IODFs be cataloged. At IPL time, the catalog is not accessed when reading the IODF to build the UCBs and other control information. The VTOC Format 1 DSCB of the volume containing the IODF is read to determine the exact location of the IODF on the DASD volume. Once the IODF is located, the IODF is processed sequentially by IPL processing. When the catalog is opened, IOS initialization routines check to see whether the IODF is cataloged. If the IODF is not cataloged, MVS issues the message:

*IOS509I DYNAMIC I/O CONFIGURATION CHANGES ARE NOT ALLOWED,
SYS4.IODFx(xx IS NOT CATALOGED

The IPL completes, but dynamic I/O reconfiguration is not permitted. In order to rectify this situation, the user must catalog the IODF in the appropriate catalog. Once the IODF is cataloged, dynamic I/O reconfiguration is permitted. The system does not have to be re-IPLed.

3.12 Multiple Configurations in a Single IODF

The installation must decide whether to create one IODF for each processor or to combine the I/O definitions for two or more processors in a single IODF. The advantage of including two or more processors with shared devices in one IODF is that the information for shared devices has to be entered only once.

A second reason to consider maintaining I/O configuration definitions for several processors in one IODF is that it allows you to easily move I/O configurations from one partition to another (in either the same hardware complex or separate complexes).

The general recommendation is to create one IODF for a “logical processor complex”; that is a group of processors that share I/O devices. In this way, one
MVS system can be used for updating the IODF with the configuration changes, which minimizes the chance of error.

It is recommended that you maintain your switch configurations in the same IODF as the hardware and software configuration definitions. This recommendation follows the philosophy of having a single IODF controlling the entire processor complex.

If you previously have had multiple IODFs defining your complex, the HCD Copy/Merge Function can be used to copy relevant parts of configuration data from a source to a target IODF, or even from areas within an IODF.

For example, to copy processor information from one IODF to another:

1. Select a processor from the Processor List panel, and the **Repeat (Copy) processor configurations** action from the context menu.
2. Specify the name for the target IODF. By default this will appear as the current IODF, but may be changed.
3. Complete the Processor ID field on the Repeat Processor panel (see Figure 8) and press Enter.

```
<table>
<thead>
<tr>
<th>Specify or revise the following values.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor ID . . . . . . . . . . . . . .</td>
</tr>
<tr>
<td>Processor type . . . . . . . : 9672</td>
</tr>
<tr>
<td>Processor model . . . . . : E03</td>
</tr>
<tr>
<td>Configuration mode . . . : LPAR</td>
</tr>
<tr>
<td>Serial number . . . . . . . : 0401049672</td>
</tr>
<tr>
<td>Description . . . . . . . . : Cluster(01) CPCID(2)</td>
</tr>
<tr>
<td>Specify SNA address only if part of an S/390 microprocessor cluster:</td>
</tr>
<tr>
<td>Network name . . . . . . . : USIBMSC +</td>
</tr>
<tr>
<td>CPC name . . . . . . . . . : P101 +</td>
</tr>
</tbody>
</table>
```

*Figure 8. Copy a Processor Definition (Repeat)*

4. The processor along with its dependent objects and attachments are copied across.

A selected object and its dependent parts are copied as follows:

- **Processors**: Partitions, channel paths, attached control units and devices
- **Partitions**: Attached channel paths, control units and devices
- **Operating System**: Assigned devices, console list, EDT
- **EDT**: Esoteric groups, generic groups

If the target object doesn’t already exist within the IODF, it will be created with the values and definitions of the source.
Where the target object already exists, a merge action occurs, and the definition of the target object is changed or added to by the source.

### 3.13 Determining Whether an IODF Is a Production or Work IODF

If you adhere to the naming conventions discussed in 3.1, "IODF Naming Conventions" on page 8, you will have no problem determining whether an IODF is a production or work IODF. If you would like to determine the nature of an IODF not adhering to the naming convention, either issue the SHOWIODF command, and the panel as shown in Figure 10 is displayed; or use the following method.

1. On the HCD Primary Menu panel, enter your IODF name, select *Maintain I/O definition files* and press Enter.
2. Select *View I/O definition file information*.

![Figure 9. Select 'View IODF Information'](image)

3. The *IODF type* field indicates that this is a production IODF.

![Figure 10. View IODF Information Panel](image)
3.14 IODF Release Level Compatibility

It is permissible to share an IODF amongst multiple MVS systems running at different levels. There are, however, restrictions on which functions; IPL, IODF usage and dynamic reconfiguration may be performed. For more information please refer to MVS/ESA Hardware Configuration Definition: User’s Guide.

3.15 Upgrading an IODF

Although it is possible to view a Release 3 IODF using HCD Version 5, any attempt to update requires that the upgrade task first be performed. A Release 2 IODF must be upgraded before any action is taken against it. The upgrade function ensures that the IODF is correctly formatted to run at the latest level.

1. From the HCD Primary menu, select Maintain I/O definition files and the Upgrade I/O definition file to new format action.

2. On the Upgrade I/O Definition panel, specify the name of the IODF to be upgraded.

You have the option to either:

- Upgrade into a new work IODF
- Upgrade in place

![Figure 11. Upgrading an IODF to HCD Version 5 Format](image)

It is important to note that if “upgrade in place” is requested, the IODF must be large enough to contain the new work IODF. An upgraded IODF is 50%-80% larger than an original Release 2 IODF. A Release 3 IODF is the same size as a Version 5 IODF.

When upgrading a Release 2 IODF to the new format, HCD automatically increases the space allocation by 80%. In other words, the default size of the new IODF is equal to the size of the down-level IODF + 80%.

If you plan to add or change many devices in the configuration, please ensure that you increase the space allocation when creating the IODF to allow for these changes.

The “upgrade in place” option cannot be requested for a production IODF (as a production IODF cannot be altered). Further, the final result of the upgrade IODF function is always a work IODF.
### 3.16 Transporting an IODF

Some installations share a “logical IODF”; that is, they have individual copies of the original master IODF for each of the systems whose configurations are defined in the IODF.

Assuming that NJE is active, it is possible to transmit IODFs between systems. Export IODF can run as either a batch job, or via the Maintain I/O Definition Files panel.

1. Select **Maintain I/O definition files** from the HCD Primary Menu panel.
2. Select **Export I/O Definition File**.
3. The Export IODF panel is displayed (Figure 12).

   ![Export IODF panel](image)

   **Figure 12. Exporting an IODF to an Attended Node**

   Select the name of the IODF to be exported. You may select the default or press F4 to prompt. Then enter the user ID and node ID or the nickname of the user to which you wish the IODF to be transmitted. You can also specify whether you are sending the IODF to an attended or unattended node.

4. HCD transmits a sequential data set.

   At an attended node, the user must:
   - Receive the IODF data set (TSO RECEIVE command).
   - Call the HCD IMPORT utility to import the IODF; this can be done only through the HCD dialogs or the HCD batch utility.

   At an unattended node:
   - The IODF is received through the JES Internal Reader as part of the batch job.
   - The job then calls the HCD IMPORT utility, which creates a copy of the original IODF on the receiving node.

   If you do not have an NJE connection, the HCD Export option is not available to you. However, you can run an IDCAMS EXPORT job to send the IODF to tape and IDCAMS IMPORT at the receiving node.
To Import an IODF, select **Import I/O definition file** from the Maintain I/O definition files panel.

On the Import IODF panel specify the name of the data set into which the exported IODF was received, and the name of the target IODF.

```
CBDFUTA3
Specify the following values.

Import from a data set:
Data set name . . SY54.saved.dataset.name

Target IODF name | SY54.IODF99 |
```

**Figure 13. Importing an IODF**

It is recommended that you transfer your production (not work) IODF to other systems.

It is possible to share IODFs amongst multiple MVS systems at differing levels, but certain restrictions should be considered. See *MVS/ESA Hardware Configuration Definition: User’s Guide* for details on which restrictions apply. Generally though, it is possible to IPL backlevel MVS/ESA systems with a V5 IODF, but care must be taken when attempting to perform a dynamic reconfiguration.

The import function does not change the IODF format. HCD Release 3 can import an IODF created by HCD V5. This IODF cannot be accessed by HCD Release 3, but it can be used to IPL a MVS 4.3 system.

### 3.17 Activity Log File

The Activity Log file is a sequential data set associated with the IODF. The name of the Activity Log file is the name of the IODF with “ACTLOG” appended. HCD allocates the Activity Log file using the following values when activity logging is enabled for the IODF. Although it is normal for this data set to be placed by SMS, you can control the volume that HCD places the Activity Log file on through the ALLOCxx member in SYS1.PARMLIB, by the HCD profile entry ACTLOC_VOL, or by the default unit parameter in the UADS entry associated with your TSO user ID.

<table>
<thead>
<tr>
<th>Space Units</th>
<th>Tracks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary quantity</td>
<td>10</td>
</tr>
<tr>
<td>Secondary quantity</td>
<td>10</td>
</tr>
<tr>
<td>Block size</td>
<td>6400</td>
</tr>
<tr>
<td>Record size</td>
<td>80</td>
</tr>
</tbody>
</table>
Activity logging allows you to keep track of all changes made to the IODF. When you switch to another IODF or you are leaving HCD and you have modified the IODF, HCD displays the panel shown in Figure 14. In this panel, you can provide a free format description of all changes you made to the IODF. The description, together with your user ID and a timestamp, is recorded in the Activity Log file. Even if you do not provide comments on the changes you made, the timestamp and your user ID are recorded.

![Activity Log Panel](image)

**Figure 14. Activity Log Panel**

You can view the Activity Log file at any time. HCD provides a function that allows you to browse the Activity Log file associated with the IODF you have currently accessed. To browse the log:

1. Select **Print or compare configuration data** from the HCD primary menu panel. Ensure that the IODF specified on the main panel is the one whose Activity Log file you want to look at. Figure 15 shows the next panel.

   ![Print or Compare Configuration Data Panel](image)

   **Figure 15. Query and Print Configuration Data Selection Panel**

2. Select **View the activity log**. This displays the panel showing the Activity Log file (Figure 16). Scroll to the bottom to see the most recent entries.

   HCD maintains a “change reference number” which is a decimal number consecutively assigned for each change made to the IODF. The change reference number can be used to refer to a previously made change. Note
that you have to exit the panel by pressing F3 or F4. This is because HCD invokes the ISPF/PDF browse utility for displaying the Activity Log file.

**Figure 16. Viewing Activity Log File**

Alternatively, if you are familiar with the naming conventions used by HCD for the Activity Log file, you can look at the Activity Log file yourself using the ISPF/PDF editor or browse utility. Basically, there is no difference between the displays because HCD makes use of the ISPF/PDF browse utility.

HCD does not provide any function for automatically enlarging the Activity Log file when a short-on-storage condition occurs. You have two options:

1. Edit the Activity Log file and delete a number of older entries.
2. Allocate a larger data set for the Activity Log file.
Chapter 4. Common Tasks

This chapter describes how to define configurations by entering the data manually. Most installations will want to use the HCD Migrate function to convert their existing definitions into HCD format, covered in Chapter 6, “Migration” on page 181. Even if you plan to use migration as the initial step, this chapter gives you a useful insight into HCD panel structure and flow.

This chapter describes many of the common tasks that an installation should perform to implement a complete system. The examples start with simple scenarios and build up to more complex ones. The first section gives examples of defining devices individually using the HCD main panel as a starting point for each definition. The second section gives an example of defining a subsystem as one entity using a hierarchical approach.

If your configuration is small enough, a useful exercise is to enter your configuration by hand in one IODF, then migrate your existing MVSCP and IOCP input decks into another IODF. The IODF compare function can be used to compare the two definitions to highlight migration and manual-entry differences.

4.1 Sample Definitions

This section gives examples of common tasks that must be performed to create a configuration. The HCD Primary Task Selection panel is the common starting point for all examples.

4.1.1 Panel and Definition Relationships

To help understand how you can use HCD to define your configuration, you have to consider that there are two major parts to the configuration; the operating system part relating to the MVSCP, and the hardware configuration part relating to the IOCP. The two parts are tied together at the device and the partition or processor level. HCD allows the definition of separate hardware and software components, but prompts you for connection data to tie the two parts together. To avoid unnecessary effort in connecting the parts, an optimum path can be chosen.

HCD allows the creation of configuration objects starting at different levels. For example, you could define a control unit and then its devices without specifying a processor to which it belongs. At any entry level, you can define lower-level objects. Connection upward can be made only to objects already defined. There are several entry points into the Hardware Configuration Definition dialog using the options of the Define, Modify, or View Configuration Data panel that is also called the primary definition panel. A definition can be started from a higher-level element or directly from the primary definition panel. The first part of this chapter shows the definition from the primary definition panel. A later example of defining a 3490/3495 shows the process starting from the processor and working down directly without returning to the primary definition panel.
4.1.2 Sample Configuration

The following example defines a system consisting of the hardware shown in Figure 17.

This configuration is not meant to represent a complete, usable system, but is used to highlight some of the considerations and relationships between the various functions in the HCD application.

The tasks covered in this section are:

- Defining an IODF data set
- Defining the operating system
  - Defining an EDT and esoterics
- Defining a processor, partitions, and channel path IDs
- Defining a control unit
- Defining devices on the control unit and to the operating systems

4.1.3 Defining an Initial IODF

On entering HCD, you are presented with the HCD primary menu panel. The first time you use HCD, you must enter the IODF name that you wish to use. If this is not the name of an existing IODF, HCD creates a work IODF for you. See Chapter 3, "IODF Considerations" on page 7, which covers IODF creation and naming conventions.
If you have a production IODF, you may use it as a base to work from. For most purposes, it is advisable to start from the active production IODF. This is mandatory for a dynamic environment. To determine the current production IODF, select option 2 from the primary menu, then select by number View Active Configuration.

This displays the following View Active Configuration panel, from which you may determine the currently active IODF.

![View Active Configuration Panel](image)

Figure 18. View Active Configuration Panel

### 4.1.4 Defining Operating Systems

It is recommended that you define the Operating System Configuration first. It is possible to define both MVS and VM operating system environments, but only MVS is considered here. The OS configuration contains definitions for I/O devices, NIP consoles, EDTs and esoterics.

The relationships of the elements in the MVS operating systems are shown in Figure 19.

![OS Configuration ID Related Elements (MVS Only)](image)

Figure 19. OS Configuration ID Related Elements (MVS Only)

To define an operating system, proceed as follows:

1. From the HCD Primary menu select Define, Modify or View Configuration data, then select Operating System Configurations. Figure 20 is displayed.
2. Press F11 to add an operating system.
3. Complete the Add Operating System Configuration panel with the required
details for your operating system.

Having defined the operating systems, you can now define the EDTs.

4.1.5 Defining an EDT

An EDT is a list of esoteric names. Each esoteric is a list of devices that can be
accessed under that name. There can be more than one such list in each MVS
operating system definition, but only one may be in use at any one time in each
operating system. You define an EDT as follows:

1. Select an operating system from the OS Configuration List panel, and the
   Work with EDTs action from the context menu. See Figure 22.
Actions on selected operating systems

CBPOSFX

Select by number or action code and press Enter.

5 1. Add like ................................ (a)
2. Repeat (copy) OS configurations .... (r)
3. Change ................................. (c)
4. Delete ................................. (d)
5. Work with EDTs .................... (s)
6. Work with consoles ............... (n)
7. Work with attached devices ...... (u)
8. View generics by name ............ (g)
9. View generics by preference value (p)

2. On the EDT List panel, (Figure 23), press F11 to add an EDT. See Figure 24.

3. Enter the EDT number using a 2-character alphanumeric identifier (00 in the example in Figure 24) and a description for the EDT. Pressing Enter
returns you to the panel shown in Figure 23, but with the just defined EDT displayed.

4. Select the EDT and the **Work with Esoterics** action from the context menu. See Figure 25 for an example of the Esoteric List panel.

```
┌───────────────────────────── Esoteric List ───────────────────────────┐
│ Goto Filter Backup Query Help │
│ ──────────────────────────────────────────────────────────────────────│
│ CBDPESF0 │
││
│ Select one or more esoterics, then press Enter. To add, use F11. │
││
│ Configuration ID . : OSPROD Production System │
│ EDT identifier . . : 00 Primary EDT │
│ / Esoteric V10 Token State │
│ *************************** Bottom of data ************************** │
└───────────────────────────────────────────────────────────────────────┘
```

Figure 25. Esoteric List Panel

5. Use F11 to add an Esoteric. See Figure 26 for the panel on which you add an esoteric name.

```
┌───────────────────── Add Esoteric ─────────────────────┐
│ CBDPES10 │
││
│ Specify the following values. │
││
│ Esoteric name . . . DASDA_ │
│ VIO eligible . . . No (Yes or No) │
│ Token . . . . . . ____ │
└────────────────────────────────────────────────────────┘
```

Figure 26. Defining DASDA As an Esoteric Name

6. The esoteric token is an optional value. In the past there have been access problems with data sets cataloged with an esoteric device group name. HCD arranges esoterics alphabetically, but the catalog contains the EDT index entry pointing to the esoteric. Once HCD had reordered the esoterics, allocation searched the incorrect device for a data set. If you specify an esoteric token, this token will be used as entry point to the catalog. Specify the token such that your existing esoteric order is maintained.

Devices can be added into each esoteric during device definition (covered later in this chapter).

### 4.1.6 Processor Complex, Partition, and Channel Subsystem Definitions

More than one processor may be defined in an IODF, and for each processor defined, the channel subsystem may be configured.

Define a processor as follows:

1. From the Define, Modify or View Configuration Data panel select **Processors**. This displays the list of the processors that have been defined.
2. Press \textit{F11} to add a processor.

Enter the Processor ID and the type and model of the processor you want to define. The processor type and the processor model fields are promptable.

You should also enter the serial number of the processor in the format nnnnntttt, where nnnnnn is the 6-character serial number of the processor and tttt is the processor type; for example, 3090 or 9121. This field is optional. However, when you have completed the definition and wish to write out an IOCDS, HCD checks the serial number specified here. If you are not running on a 9672/4 and it does not match the physical processor for which IOCDS download was requested, the Write IOCDS action terminates. This check is not made when the serial number field is blank, or the processor type is a 967x.

If you do not know the serial number of the processor, it can be displayed using a `D M=CPU` command (use the last six digits of the "CPC ND" field in the output from the display command).

Lastly, specify whether the processor is to operate in BASIC or LPAR mode. Figure 27 shows an example. Note that the "Network name" and "CPC name" fields are left blank. These fields are only used when defining a S/390 microprocessor (9672 and 9674).

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{add_processor.png}
\caption{Define a Processor}
\end{figure}

For some processor types and models, there may be more than one "support level" for channel path types, EMIF, coupling facility support, and so on, depending on which features are installed. If you define a processor that has optional support levels, then the panels, shown in Figure 28, are displayed with a list of the available support levels for your processor. You should always specify the correct level of support for your processor, even though you may not be using the function provided with the installed level of support. This ensures that the function is available for use at a later time without additional change, and ensures the use of the correct support level for the processor during HCD operation. In the example here, you are given three choices.
Place the cursor on the line that matches the support level installed on your processor and press Enter.

Note the > after the word More in the upper right corner of the panel shown in Figure 28. This indicates that there is more information to be seen by scrolling to the right. Use F20 to display this part. In this instance, the information covers the support level, specific channel path type information, protocol information, and so on. Later examples assume an EMIF capable processor is installed, so that has been selected here.

**Note:** ESCON Multiple Image Facility (EMIF) provides the capability for sharing ESCON channels between logical partitions within a processor complex.
If LPAR is the selected mode of operation, you must now define partitions for the configuration.

**Note:** You may also define partitions for processors defined in BASIC mode to facilitate a subsequent migration to LPAR mode.

The partitions are added as follows:

1. Select a processor from the Processor List panel, and the **Work with partitions** action from the context menu.

2. On the Partition List panel, press F11 to add a partition. The Add Partition panel is shown in Figure 29.

The partition number is required only on EMIF-capable processors and is used by the channel subsystem to direct I/O to the correct partition on EMIF shared CTC channel paths, and to determine the source of I/O requests for some control units. If you do not specify a partition number, HCD takes the next free number starting with 1.

The partition usage type is important only in a coupling facility configuration and is used by HCD for validation purposes.
Figure 29. Define a Logical Partition

Having defined the partitions, you can now define the channel paths.

A channel path may be dedicated, reconfigurable, or shared, depending on its type. Choose the channel path mode according to the following decision table:

<table>
<thead>
<tr>
<th>Mode</th>
<th>Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dedicated</td>
<td>If you want only one logical partition to access the channel path.</td>
</tr>
<tr>
<td>Reconfigurable</td>
<td>If you want only one logical partition at a time to access the channel path, and you want to be able to reconfigure it from one logical partition to another.</td>
</tr>
<tr>
<td>Shared</td>
<td>If you want more than one logical partition to access the channel path simultaneously.</td>
</tr>
</tbody>
</table>

The following example shows how to add reconfigurable channels:

1. Select a processor from the Processor List panel, and the Work with attached channel paths action from the context menu.

2. Press F11 on the Channel Path List panel to add a channel path. The resulting panel is displayed in Figure 30. HCD distinguishes between the dynamic and entry switch when defining a channel path. The dynamic switch is the switch holding the dynamic connection. The entry switch is the switch the channel path is physically plugged in.
Add Channel Path

Specify or revise the following values.

Processor ID . . . : BLUESYS  ES/9000 962
Configuration mode : LPAR

Channel path ID . . . . . . . 00 +
Number of CHPIDs . . . . . 12
Channel path type . . . . . CNC +
Operation mode . . . . . REC +
Description . . . . . . . . . Reconfigurable CHP______________

Specify the following values only if connected to a switch:

Dynamic switch ID . . . . . . __ + (00 – FF)
Entry switch ID . . . . . . . __ +
Entry port . . . . . . . . . . __ +

Figure 30. Define Channel Paths

Note: You can define multiple channels in one step. If you do so and have also specified an entry switch and entry port for the channel path, HCD displays another panel where you can specify the entry switch and port number for the subsequent channel paths.

3. You must specify the connection between channels and the partitions in the subsequent panels. See Figure 31.

For EMIF-capable processors, you can specify an access list and a candidate list for each channel path that is either shared or reconfigurable. For non-EMIF-capable processors with reconfigurable channels, you can specify only the access list, and all other partitions are assumed to be in the candidate list.

An access list defines the partitions that are given access to the channel path at initial POR. This information is taken from the IOCDS written from the IODF that contains the definition. This information remains the same as long as no configuration changes are made while the IOCDS is active.

A candidate list defines the partitions that could be given access to the channel after POR using an IOCDS written from the IODF that contains the definition. This is valid as long as no configuration changes are made while the IOCDS is active.

Note: HCD’s definition of access list and candidate list is slightly different than the one IOCP knows. The HCD candidate list does not contain any partition that is already in the access list. It is viewed as an additional list of partitions that might get access to the channel path at a later time. Thus, a partition defined in the access list of a CHPID does not appear on the Define Candidate List panel. In IOCP, the candidate list includes the access list.
4.1.7 Defining a Control Unit

You should next define the control units. Proceed as follows:

1. Select **Control Units** from the Define, Modify or View Configuration Data panel.

2. On the Control Unit List panel, press *F11* to add a control unit.

3. Complete the Add Control Unit panel shown in Figure 33.
If you are uncertain about free control unit numbers, place the cursor on the Control unit number field and press F4, to display a list of available CU numbers. Specifying a number in the control unit number field causes HCD to start displaying the next free 128 control unit numbers from the specified value.

You may prompt in a similar way for valid control unit types. If you are defining a non-IBM control unit, refer to 12.2, "Defining OEM Equipment" on page 275. If the control unit is to be connected through an ESCON Director, the Add Control Unit panel is used to define the switch ID and port to which the control unit is connected. It is recommended that the switch be defined prior to defining the control units. See 4.3, "Integrating an ESCON Director" on page 52.

4. Pressing Enter on the completed panel leads you to the Select Processor / Control Unit panel shown in Figure 34.

5. Select a processor, and the Select (connect, change) action on the context menu (or action code $).

---

Figure 33. Add a 3990-3 Control Unit

Figure 34. Select Processor for 3990-3 Attachment
6. The "Add control unit" panel is displayed. See Figure 35. HCD displays a full menu of connection details that must be completed.

The logical address is used for control units that have to present more than one partition to the channel. This relates to the CUADD parameter in IOCP. Examples of this are 3990s in DLS mode and ESCON-attached SNA 3174s, and SCTCs using an EMIF shared channel. Notice that HCD may provide default values for the protocol and I/O concurrency level fields, depending on the control unit type being defined.

![Add Control Unit Panel]

Figure 35. Attach Control Unit to Channel Path

7. After having entered the appropriate values on the panel in Figure 35, press Enter. Figure 34 on page 39 is displayed with the new details completed. Note that "Yes" is shown in the "Att" column, indicating that the control unit is defined to the processor in the same row.

4.1.8 Defining I/O Devices

I/O device data is needed by the operating systems so that the devices can be addressed by the operating systems. The data is also needed by the CSS to provide the information needed to perform I/O to a specific device. Devices can also be added to esoteric groups in the EDTs. Local non-SNA displays can be added in the MVS NIP console lists and VM console lists.

Note: NIP consoles cannot be defined in this step. First define the display devices and connect them to the operating system. In a second step define the display devices as NIP consoles.

As each device or group of devices is defined, you go through a process of adding them to the processor definition and then to the operating systems definitions. For devices attached to EMIF shared channels, the hardware definition allows you to specify the partitions that can access the device using an explicit device candidate list when it is required that access to the device be more restrictive than the CHPID access list.

The explicit device candidate list defines the list of logical partitions that have access to the device. Any partition that is not in the explicit device candidate list
will not have access to the device, even if a channel path assigned to the device can be accessed by that partition. An explicit device candidate list may not be specified if the device is attached to unshared channel paths. If a device candidate list is not explicitly specified for devices attached to shared channel paths, the explicit device candidate list defaults to all partitions in the configuration. The operating system definition allows you to specify the device parameters and features to the operating system, followed by the option to add the device to an esoteric in an EDT if an EDT and esoterics are defined for the operating system.

Devices may be defined as follows:

1. On the Define, Modify or View Configuration data panel, select option I/O devices. This displays the I/O Device List panel.

2. Press F11 to add devices.

3. Complete the Add Device panel shown in Figure 36. When you add a range of devices, and you specify the first device serial number or a general description, you are prompted for the serial numbers of the other devices, and are allowed to modify the description of each device.

4. After you provide the required data, press Enter. The Device/Processor Definition panel in Figure 37 is displayed to enable the connection to the processor. This panel is shown only if you have connected the device to a previously defined control unit (shown in Figure 36) and the control unit is connected to one or more processors.
Select processors to change device/processor definitions, then press Enter.

Device number . . : 0100 Number of devices . . : 64
Device type . . : 3390
/ Processor ID UA + Time-Out STADET Preferred Explicit Device
/ BLUESYS Yes Yes No
**************************************** Bottom of data ****************************************

Figure 37. Select Processor for Device Attachment

5. Select the required processor ID. This displays the panel shown in Figure 38 to allow you to specify device/processor characteristics. The explicit device candidate list usage should be understood for EMIF shared SCTC devices and shared SNA 3174s (the explicit device candidate list is available only on processors defined as EMIF-capable and when using shared channels).

Specify or revise the following values.

Device number . : 0100 Number of devices . . : 64
Device type . : 3390
Processor ID . : BLUESYS ES/9000 962
Unit address . . . . . . . . 00 + (Only necessary when different the last 2 digits of device number)
Time-Out . . . . . . . . . . Yes (Yes or No)
STADET . . . . . . . . . . Yes (Yes or No)
Preferred CHPID . . . . . . . . +
Explicit device candidate list . No (Yes or No)

Figure 38. Define Device / Processor Panel

6. Pressing Enter displays the Device / Processor Definition panel again. Connect the devices to other processors, if necessary.

7. Pressing Enter again displays the Define Device to Operating System Configuration panel shown in Figure 39. This lets you specify the operating systems to which the devices are to be defined. Select the Config ID, and the Select (connect, change) action (or action code $) to connect the devices to each operating system.
Figure 39. Define Device to Operating System Configuration Panel

Note that "YES" is later shown in the "Defined" column to indicate that this device has been defined for the operating system in the same row.

8. Pressing Enter displays the Define Device Parameters / Features panel shown in Figure 40. This allows device features to be specified to the selected operating system. This panel is shown for each of the operating systems to which the device is to be connected.

Figure 40. Define Device Parameters / Features Panel

The following MVS operating system features should be reviewed:

- The OFFLINE feature defaults to the value specified in the UIM (which may not be appropriate for tape devices and ESCON directors).

- The DYNAMIC feature defaults to "Yes" for devices that allow dynamic reconfiguration. Check your subsystems and applications that manage
their own devices to make sure they support dynamically modified device control blocks (UCBs).

The status of a device may be changed from DYNAMIC=YES to DYNAMIC=NO, and vice versa, by a software-only dynamic change to a configuration. When changing from DYNAMIC=NO to DYNAMIC=YES, this must be the only change made to the device at that time. You are allowed, however, to make changes to a device that is currently defined as DYNAMIC=YES and at the same time change it to DYNAMIC=NO.

**Note:** The DYNAMIC parameter is shown only when the appropriate device supports the dynamic I/O configuration function.

- The SHARED feature defaults to “No.” Since many MVS installations have more than one image, this parameter should be carefully checked and changed to “Yes” if appropriate.

9. Pressing Enter displays the Assign/Unassign Device to Esoteric panel.

10. Specify Yes or No to assign or unassign devices to the esoteric. If you do not want to assign all the devices currently being defined to this esoteric, you can limit the devices being assigned by specifying a starting device number and the number of devices to be assigned.

11. Press Enter to go back through the panels to the Device List panel.
4.2 Defining a 3490 and 3495 Tape Library

The IBM 3495 Tape Library Dataserver is a software-only definition. HCD is used to define the constituent 3490/3490E drives. The operating system device definition support includes the LIBRARY parameter to specify operation of a 3495 in library mode.

HCD allows a top-down process of defining a configuration. For example, HCD allows the definition of a device from within a control unit; a control unit definition from within a channel path definition; a channel path from within a processor definition. See Figure 42.

![Configuration Definition Process](image)

Figure 42. Configuration Definition Process

The top-down process of defining the 3490s is as follows:

1. Select the processor to which you will attach the library.
2. Define the CHPID to the processor.
3. Define the 3490 control unit.
4. Define the 3490 devices and connect them to the processor.
5. Connect the 3490 devices to the operating systems including the LIBRARY parameter. Refer to IBM 3495 Implementation Primer for MVS for additional information.

4.2.1 Defining the CNC Channel Path

To define the CNC CHPID that connects to the 3490, proceed as follows:

1. Select a processor from the Processor list panel, and the Work with attached channel paths action from the context menu (Figure 43).

![Processor List](image)

Figure 43. Select Processor to Attach the IBM 3495 Library
2. Select a CHPID from the Channel Path List panel, or if necessary, press F11 to add a new channel path. (Figure 44).

![Figure 44. Select Channel Path to Attach the IBM 3495 Library](image)

### 4.2.2 Defining the 3490 Control Unit

To define the 3490 Control Unit, proceed as follows:

1. Select a channel path from the Channel Path List panel, and the **Work with Control Units** action from the context menu.

   Figure 45 shows the empty control unit list for CHPID 23.

![Figure 45. Empty Control Unit List](image)

2. Press F11 to Add a control unit (see Figure 46).
3. Provide the control unit information.

The control unit for the 3495 is defined as a 3490.

Pressing Enter displays the panel in Figure 47. Note that the Channel Path ID is already completed for the system being defined.

4. Select the processor from the Select Processor / Control Unit panel, and connect it to the CU. If the control unit is attached to more than one processor, you would select each in turn. Figure 48 is then displayed.
4.2.3 Defining 3490 Devices to Hardware Configuration

To add the devices:

1. Select a control unit from the Control Unit List panel and Work with the attached devices action from the context menu.

2. On the I/O device List panel (Figure 50), press F11 to add a new device.
3. Complete the Add Device panel and press Enter. (Figure 51).

4. The Device / Processor Definition panel is displayed. Here you must select the processor to which the library will be attached. (Figure 52)

5. For each processor selected you must complete the Define Device / Processor panel (Figure 53). Ensure that the Unit Address value is the same as that specified in the Add Control Unit panel, since HCD assumes that the

---

**Figure 50. I/O Device List for the IBM 3495 Library**

**Figure 51. Define an IBM 3495 Device**

**Figure 52. Select the Processor for the IBM 3495 Device**
unit address is the same as the low-order part of the device number. The unit address field may have to be modified.

![Define Device / Processor](image1)

**Figure 53. Define the IBM 3495 Device**

6. Press Enter to return to the Device/Processor Definition panel shown in Figure 54.

![Device / Processor Definition](image2)

**Figure 54. Select the Processor for the IBM 3495 Library**

### 4.2.4 Defining the 3490 Devices to the Operating Systems

It is now necessary to connect the 3490 to the OS configuration.

1. On the Define Device to Operating System Configuration panel, (displayed when you press Enter from the Device / Processor Definition panel), select an operating system configuration ID. (Figure 55).
Figure 55. Define the 3495 Device to the Operating System Configuration

2. For each configuration selected, the Define Device Parameters / Features panel will be displayed. Confirm the parameter values are as desired, paying special attention to the LIBRARY parameter (Figure 56). This must be changed to Yes to ensure, the 3490 devices run in library mode. This status takes effect at dynamic activation time. The panel in Figure 57 shows the definition after adding the devices to the OSPROD operating system in our example.
Keep in mind that only the IBM 3490 family of devices, including 3490s defined as 3480s, are supported in the 3495. However, 3490 models B02, B20, Dxx, and Cxx are not supported as part of a library.

Devices are automatically recognized as IBM library devices during IPL or dynamic IODF activation. The library serial number, that is, the LIBID of the 3495, is returned by the 3490 control unit’s response to a Read Device Characteristics channel command word (CCW). Refer to IBM 3495 Implementation Primer for MVS for additional information.

Pressing Enter takes you to the EDT selection and esoteric definition. This is not covered here again, since it is described in 4.1.8, “Defining I/O Devices” on page 40. See also 4.11.2, “Adding Devices to Esoterics” on page 125 for more details.

Finally, you return to the panel shown in Figure 57. Note the Yes in the “Defined” column, which indicates that the devices have been defined for that particular operating system.

Since you have defined all the configuration in a top-down manner, you must now step back up the hierarchy using F3 or F12 until you return to the HCD primary definition panel.

### 4.3 Integrating an ESCON Director

This section shows you how to integrate an ESCON Director into your configuration. The tasks covered in this section are:

- Defining a switch
- Defining a switch control unit and a switch device
- Defining a switch configuration
- Defining a 3990 Control Unit using an ESCON director (non-EMIF channels)
4.3.1 Switch Overview

With the introduction of the ESCON architecture and its supporting hardware, ESCON directors are becoming an integral part of the configuration. Using HCD to define the switch provides a number of advantages.

- **Validation of the configuration definition**

  If all switches that are between the channels and the control units are defined, HCD can determine whether a valid path exists between the processor and the control unit. For example, HCD is able to validate that the destination link address (DLA) specified for a channel path is a valid port on the dynamic switch.

  HCD allows two switches to be chained on the path from the channel to the control unit, but ensures that only one switch has a dynamic connection between the entry and exit port. Again, this kind of validation is done only when informing HCD about the physical connections of each switch.

- **Definition and activation from the same work place**

  Besides defining the switches from the hardware viewpoint, you can define switch configurations, also called port matrixes. A switch configuration defines how the various ports of the switch connect to each other. For example, the switch configuration defines whether a port is blocked, has a dedicated connection to another port, or whether dynamic connections to other ports are allowed or prohibited. In other words, a switch configuration defines the inside of a switch.

  If you have defined a switch configuration using HCD, you can activate the switch configuration without leaving HCD; no knowledge of any other MVS components that are involved in the activation process is required.

You do not have to define the switches that you have in your configuration in the IODF, but if you do not, you will not get the advantages mentioned above. The basic principle is that the more switch related data you specify, the more validation HCD can do. For example, path validation is triggered by HCD only when the physical connectivity of the channel paths and control units to the switch is defined to HCD.

However, if you want the benefits of the additional validation as well as having a single point of control for all kinds of configuration data, perform the following steps:

1. Define the physical switches.
2. Define at least one switch configuration (port matrix) for each switch.
3. Define what is physically connected to the various ports of the switch, such as:
   - Channel paths
   - Control units
   - Other switches

If your IOCP deck contains the definition for a switch control unit or switch device, migrating this definition is handled by HCD in the same way as any other control unit or device. But HCD does not define the switch itself as part of the migration process. This, however, is necessary in order to gain the benefit of the additional validation mentioned above. Furthermore, without defining the switch correctly you are not able to migrate or activate switch configurations.
You should ensure that following migration you go through the process for defining the switch described below. However, since the switch control unit and switch device are already defined, you do not need to specify these values.

4.3.2 Defining a Switch

Adding a 9032 or 9033 ESCD with the ADD Switch function results in HCD optionally generating the switch’s control unit and I/O device definitions. The device can later be defined to the appropriate operating system configurations.

The switch definition process is as follows:

1. Select Switches from the Define, Modify or View Configuration Data panel.
2. Press F11 to add a switch. The panel for adding the switch definition is shown in Figure 58.

   ┌──────────────────────── Add Switch ────────────────────────────┐
   │ CBDPSW10 │
   │ Specify or revise the following values. │
   │ Switch ID . . . . . . . . 01 (00─FF) │
   │ Switch type . . . . . . . 9032_________ + │
   │ Serial number . . . . . . 6543219032 │
   │ Description . . . . . . . 9032 Switch 01__________________ │
   │ Specify the port range to be installed only if a larger range than the minimum is desired. │
   │ Installed port range . . C0 ─ FB + │
   │ Specify either numbers of existing control unit and device, or numbers for new control unit and device to be added. │
   │ Switch CU number . . . . 0E01 + │
   │ Switch device number . . 0E01 (0000─FFFF) │
   └────────────────────────────────────────────────────────────────┘

   Figure 58. Add ESCON Switch

On this panel, HCD allows you to define the switch itself, the range of ports installed on your ESCON Director, and the switch device and the switch control unit. The control unit is automatically connected to port FE and the switch device is connected to the control unit. This has the advantage that the definitions of switch control unit and switch device are consistent. Likewise, when deleting a switch, the switch control unit and switch device is deleted as well. However, you have still to perform the following steps:

a. Connect the switch control unit to the processor (this also establishes the switch device-processor connection). See 4.3.2.1, “Connecting a Switch Control Unit” on page 56 for a detailed description.

b. Connect the switch device to the operating system. See 4.3.2.2, “Connecting a Switch Device to an Operating System” on page 56 for a detailed description.

3. Once you have entered the new switch definition data, all defined switches are displayed, as shown in Figure 59.
4. When defining switches, you can specify the installed port range. If you omit it HCD sets only the minimum number of ports to “installed.” See the table below for more information.

<table>
<thead>
<tr>
<th>Switch</th>
<th>Minimum Installed Ports</th>
</tr>
</thead>
<tbody>
<tr>
<td>9032</td>
<td>E0 - FB, FE</td>
</tr>
<tr>
<td>9032-3</td>
<td>FE</td>
</tr>
<tr>
<td>9033</td>
<td>C0 - C7, FE</td>
</tr>
</tbody>
</table>

You may change the installed port range. To do this, select a switch then and the *Work with ports* action from the context menu. This displays the Port List panel shown in Figure 60. Additional ports may be set to “installed” by overtyping the N with a Y in the H column. You may also add names for the ports.

**Note:** Port FE is already installed by definition. This is the port to which the switch control unit is attached.
4.3.2.1 Connecting a Switch Control Unit
To connect the switch control unit, the channel path to which the switch control unit is attached must be defined as it would be for any other control unit.

1. Select **Control Units** from the Define, Modify or View Configuration data panel.
2. Select the switch control unit number and the **Change** action from the context menu.
3. The Change Control Unit Definition panel is displayed. Press Enter without making any changes.
4. Select a processor from the Select Processor / Control Unit panel and the **Select (connect,change)** action from the context menu. This displays the Change Control Unit Definition panel, shown in Figure 61.

![Change Control Unit Definition panel](image)

Figure 61. Defining the Control Unit for a Switch

5. Enter the Channel Path ID, and the Link Address of FE. A unit address of 00 should be specified. If you do not perform this step, then any attempt to create a production IODF will fail with:

```
E CBDG065I The switch control unit 0E01 of switch 01 has no channel path attached via the switch.
```

4.3.2.2 Connecting a Switch Device to an Operating System
You have to associate the switch I/O device with an operating system. Proceed as follows:

1. Select **I/O Devices** from the Define, Modify or View Configuration Data panel.
2. Select the switch device number, and the **Change** action from the context menu. Several panels are displayed in sequence. Press Enter until the Define Device to Operating System Configuration panel, as shown in Figure 62, appears.
Define Device to Operating System Configuration

CBPDVOS Row 1 of 2

Select OSs to connect or disconnect devices, then press Enter.

Device number . : 0E01 Number of devices : 1
Device type . . : 9032

/ Config. ID Type Description Defined
  OSPROD MVS Production System
  OSTEST MVS Test System

************************** Bottom of data ***************************

Figure 62. Defining the Operating System Connection for a Switch Device

3. Select the operating system to which you wish to attach the switch device and the Select (connect,change) action from the context menu.

4. On the Define Device Parameters / Features panel leave the OFFLINE Value as Yes, as shown in Figure 63. Press Enter without any entry in all the following panels until you are back to the I/O Device List panel, and then press PF3 to exit to the HCD primary definition menu.

CBPDV13 Define Device Parameters / Features Row 1 of 2

Specify or revise the values below.

Configuration ID . : OSPROD Production System
Device number . . : 0E01 Number of devices : 1
Device type . . . : 9032

Parameter/ Value P Req. Description
Feature
OFFLINE Yes Device considered online or offline at IPL
DYNAMIC Yes Device supports dynamic configuration

****************************** Bottom of data ******************************

Figure 63. Defining Parameters and Features for a Switch Device

4.3.2.3 Defining Connections to a Switch

Define the channel to switch connections as follows (this is only required if at channel definition time the entry switch and entry port were not defined):

1. Select a switch from the Switch List panel, and the Work with ports action from the context menu.

2. Select a port from the Port List panel and the Connect to channel path action from the context menu. See Figure 64.

Specify the processor ID and channel path ID to which this port is to be connected.

3. Repeat this step for all channel paths that are attached to a port.
Define the control unit to switch connections as follows:

1. Select a switch from the Switch List panel and the **Work with ports** action from the context menu.

2. Select the port from the Port List panel and the **Connect to control unit** action from the context menu. The resulting panel is shown in Figure 65. Here you specify all the control units that are attached to that port.

You can see that port FE is automatically connected to the switch internal control unit. This connection must not be deleted.

**Note:** If the switch is defined in an IODF before the channel paths and the control units are defined, the port connection definitions are defined as part of the channel and control unit definitions.

Define the switch-to-switch connection as follows:

1. Select a port from the Port List panel and the **Connect to switch** action from the context menu.

2. Specify the switch ID and port of the adjacent switch. See Figure 66.
4.3.2.4 Defining a Switch Configuration

A switch configuration defines the port connectivity for all installed ports to any other port of the switch. A port can be connected to any other port. Optionally, a port can be "dedicated" to another port, "prohibited" from communicating with other ports, or "blocked" from communicating.

To define a switch configuration:

1. Select a switch from the Switch List panel and the Work with switch configurations action from the context menu.

2. Press F11 to add a new configuration. The simplest form of a switch configuration is an "any-to-any" connection. However, in this example, we show prohibiting all connections and show one method of specifying "allowed" connections only for those ports that are permitted to communicate with each other.

3. Complete the switch configuration definition as shown in Figure 67 and press Enter.

4. Select the new configuration from the Switch Configuration panel and the Work with port matrix action from the context menu.

5. The Port Matrix panel is displayed (see Figure 68).
6. To “allow” port connections from E0 to F0 and F1, for example, scroll down until you see port E0. Scroll horizontally and overtype the appropriate field in the Dynamic Connection Ports column (in our example of F0 and F1 the first and second column) with an A (see Figure 68).

Alternatively, you can use the FIND command to position the Port Matrix showing the designated port and its dynamic connection attributes to other ports. The FIND command has two parameters, both of which are mandatory:

\[
\text{FIND port1,port2}
\]

- Port1 specifies the port column you want to see for the port you specified as first operand.
- Port2 specifies the port whose dynamic connection attributes you want to see.

FIND E0,F0 would result in displaying the Port Matrix shown in Figure 68.

### 4.3.3 Defining a 3990 and Connecting to an ESCON Director

The configuration being defined is a 3990-3 using ESCON channels attached to two 9032 ESCON directors. The configuration to be added is shown in Figure 69.

For availability reasons, the configuration is defined using two ESCON directors.
Figure 69. ESCON 3990 and Switch Configuration

The steps are:

1. Define the ESCON channels to the complex, dedicating them to the two partitions and connecting them to the ESCD switches.
2. Define the two 3990 control units, specifying the channel paths.
3. Define the DASD devices and connect them to the logical control units.

4.3.3.1 Defining ESCON Channel Paths

The channel paths have been chosen specifically to optimize availability by selecting channel paths that are on different physical cards in the processor. Doing this means that all the CHPIDs have to be defined individually, as the only adjacent CHPIDs are connected to different partitions.

Define the channel paths as follows:

1. Select a processor from the Processor List panel and the Work with attached channel paths action from the context menu.
2. Press F11 to add an new channel path.
3. Complete the channel path details. Assuming the ESCD switches have already been defined, you should enter the dynamic switch number and the entry switch number and port number. The entry port is the port where the channel is physically plugged in. The dynamic switch is the switch number of the ESCON Director where the dynamic connection takes place. In the case of single switches in each channel path, the entry switch ID is the same as the dynamic switch ID. Figure 70 shows adding CHPID 30 and its connection to ESCD port F0 on switch 01.
4. For each channel, the Define Access List panel is displayed as in Figure 71. For both reconfigurable channels and dedicated channels, only one partition may be specified. This is not true when EMIF shared channels are defined. If the processor is defined as EMIF capable, the Candidate List panel is also displayed for reconfigurable channels. For non-EMIF capable processors, all other LPARs are assumed to be in the candidate list. The access list and candidate list are discussed in 4.4.6, “Defining a 3990 on EMIF Channels” on page 74.

5. The other seven channels are defined in the same way, and the result is shown in Figure 72.
4.3.3.2 Defining the ESCON 3990-3 Control Unit

You have to specify the ports on the switch to which the control unit is attached. It is recommended that you define the switches in the IODF before defining the control units. This allows you to:

- Prompt for available link addresses (the prompt shows only those that are defined and available for the switch).
- Exploit the full “data-path validation” done by HCD.

You may have to refer to the configuration diagram shown in Figure 69 on page 61. The example shows the definition of the first of the control units (CU number 1140). To define the control unit:

1. Select Control Units from the Define, Modify or View Configuration data panel.

2. Press F11 to add a new control unit. The panel in Figure 73 must be completed.
# Add Control Unit

<table>
<thead>
<tr>
<th><strong>CBDPCU10</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify or revise the following values.</td>
</tr>
<tr>
<td><strong>Control unit number</strong> . . . 1140 +</td>
</tr>
<tr>
<td><strong>Control unit type</strong> . . . 3990-3 +</td>
</tr>
<tr>
<td><strong>Serial number</strong> . . . . . . . +</td>
</tr>
<tr>
<td><strong>Description</strong> . . . . . . . . . +</td>
</tr>
<tr>
<td><strong>Connected to switches</strong> .. 01 02 +</td>
</tr>
<tr>
<td><strong>Ports</strong> . . . . . . . . . . . E0 E0 +</td>
</tr>
<tr>
<td>If connected to a switch, select whether to have CHPIDs/link addresses, and unit address range proposed.</td>
</tr>
<tr>
<td>Auto-assign . . . . . . . 2 1. Yes</td>
</tr>
<tr>
<td>2. No</td>
</tr>
</tbody>
</table>

**Figure 73. Add 3990-3 Control Unit with Switch Port Details**

3. After specifying the details, press Enter to display the Select Processor / Control Unit panel shown in Figure 74. In this example we will show the alternate way of defining the control unit-processor connections by “overtyping.” Specify the channel paths the control unit is attached to with the link addresses, and specify the unit address and its range. Please notice that channel path ID and link address are entered in a single field and therefore must be separated by a period “.” or a comma “,”. The same rule applies for the unit address and its range. Scroll to the right to get the panel where you can specify the unit address and range. Further scrolling to the right brings you to the panel where you can specify protocol and I/O concurrency level. However, in our example of an ESCON-attached control unit, these values are ignored.

<table>
<thead>
<tr>
<th><strong>CBDPCUPO</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Row 1 of 2 More:</strong></td>
</tr>
<tr>
<td><strong>Select processors to change CU/processor parameters, then press Enter.</strong></td>
</tr>
<tr>
<td><strong>Control unit number</strong> . . : 1140 <strong>Control unit type</strong> . . : 3990-3</td>
</tr>
<tr>
<td>/ <strong>Proc. ID Att. Log. Addr.</strong> ------ <strong>Channel Path ID</strong> . <strong>Link Address</strong> + ------</td>
</tr>
<tr>
<td>(CUADD) + 1---- 2---- 3---- 4---- 5---- 6---- 7---- 8----</td>
</tr>
<tr>
<td>_ BLUESYS _ _____ _____ _____ _____ _____ _____ _____</td>
</tr>
<tr>
<td>_ BLUESYS2 _ 30.E0 33.E0 38.E0 39.E0 _____ _____ _____</td>
</tr>
<tr>
<td>________________________________ Bottom of data ________________________________</td>
</tr>
</tbody>
</table>

**Figure 74 (Part 1 of 3). Select 3990-3 Control Unit Details**
Figure 74 (Part 2 of 3). Select 3990-3 Control Unit Details

The other seven columns of unit address and unit range are for control units that support multiple address ranges. No ESCON CTC or CNC connected control units support multiple ranges.

4. Pressing Enter validates and saves the entered data and redisplays the Select Processor / Control Unit panel. Pressing Enter again returns you to the Control Unit List panel.

The other control unit is defined similarly, resulting in the Control Unit List shown in Figure 75.

Figure 75. 3990-3 Control Unit List
4.3.3.3 Defining the 3390 Devices to the 3990

Attaching devices to the two control unit pairs completes the logical definition. The devices are defined once for each pair of control units and defined to the relevant operating system. The correlation of operating system to partition is important only when making changes to the hardware and software definitions.

The devices are defined as follows:

1. Select **Devices** from the Define, Modify or View Configuration Data panel.

2. Press **F11** to add a new device. Complete the panel in Figure 76 by specifying the device number, number of devices, device type, and control unit numbers the devices are attached to for the devices you are adding.

```
Add Device

CBOPDV10

Specify or revise the following values.

Device number . . . . . . . . 0140 (0000 ─ FFFF)
Number of devices . . . . . . 64
Device type . . . . . . . . . 3390 +
Serial number . . . . . . . . __________
Description . . . . . . . . . ________________________________
Connected to CUs . . 1140 1141 ____ ____ ____ ____ ____ ____ +
```

Figure 76. Adding Devices to the First Two CUs

3. After specifying the details, pressing Enter displays the Device / Processor Definition panel shown in Figure 77.

```
Device / Processor Definition

CBOPDV11

Select processors to change device/processor definitions, then press Enter.

Device number . . : 0140 Number of devices . : 64
Device type . . . : 3390

/ Processor ID UA + Time-Out STADET Preferred Explicit Device CHPID + Candidate List
BLUESYS2 00 No Yes__ No
******************************************************************************* Bottom of data*******************************************************************************
```

Figure 77. Defining the Devices to the Processor

4. In this example, we show the connection of devices to the processor by specifying the values directly on the Device / Processor Definition panel. Some ESCON controllers have a requirement that the unit address must be X'00'. The ESCON controllers with this requirement are currently:
   - 9032 and 9033 ESCDs
   - 3990 DASD Controller
• 9345 DASD Controller
• 3490 Tape controller
• OSA control unit

Since we are defining 3990 attached 3390s, we must specify 00 under UA on the panel, as the last two digits of the device number are not X’00’ (140). Specify the correct unit address and press Enter.

5. Pressing Enter again causes the display of the panel in Figure 78.

6. Select the operating system to define the devices to, and the Select (connect, change) action from the context menu.

7. Pressing Enter displays the Define Device Parameters / Features panel shown in Figure 79. Note that you should define the devices as shared, even though they are defined to only one operating system. This is because the 3990 is shared by two (or more) system images.

8. Pressing Enter takes you to the EDT selection and esoteric definition. This is not covered here as it is covered in 4.1.5, “Defining an EDT” on page 30.
9. Repeated pressing of Enter returns you to the I/O Device List panel. After defining the devices for the second pair of control units, and to the second operating system, the updated I/O Device List panel showing all defined devices is displayed.

4.4 Adding EMIF Support

This section describes the steps required to upgrade an existing non-EMIF configuration to an EMIF configuration.

4.4.1 ESCON Multiple Image Facility (EMIF)

EMIF provides the capability to share a physical ESCON channel among multiple logical partitions running on the same processor. Before EMIF, processor channels were dedicated to individual logical partitions. The added flexibility provided by EMIF can allow users to expand the processing capacity of the system without requiring additional channels to support new workloads. In addition to easing systems management and configuration management tasks, EMIF may also reduce requirements for ESCON director ports and control unit interface adapters for supporting multiple logical partitions on the same processor. Any SCP providing full native ESCON support (TYPE=CNC/CTC channels, or directors, for example) can access devices using shared channels.

4.4.2 Upgrading the Processor

This section provides an example of upgrading a processor to an EMIF-capable processor. This example illustrates the process required to upgrade a 9021 Model 640 processor with dynamic capability to a 9021 Model 640 processor with EMIF support.

Note: It is extremely important that your processor definition reflects the hardware support installed on the processor. That is, if EMIF support is installed on the processor but the capability is not being exploited, the definition of the processor should be changed to indicate that it is an EMIF-capable processor and that the support functions invoked by HCD are at the correct level. For example, HCD uses IZPIOCP to create an IOCDS for a processor with EMIF support (rather than IXPIOCP, which does not support EMIF). To ensure that the correct level of IOCP is invoked, you should choose the correct processor support level.

The processor is upgraded as follows:

1. From the Processor List panel, select a processor and the Change action from the context menu.

2. On the Change Processor Definition panel (Figure 80), you may want to update the processor description to indicate that this processor is now EMIF-capable (for documentation purposes).
Figure 80. Change Processor Definition Panel

3. Press Enter.

4. The Available Support Levels panel is displayed. See Figure 81. Position the cursor next to the appropriate support level (Dynamic and EMIF) and press Enter.

Figure 81. Change Processor Support Level to EMIF

5. HCD automatically updates the related definitions in the IODF.

Whenever the processor is changed, you are given the opportunity to change the channel assignments. On some processor changes, the channel numbers are changed. HCD makes the best fit of the assignments and displays them for your modification. In our example, the processor model has not changed and the assignments are correct.

At this point, the channel path assignments are displayed. You may change any channel path assignments on the Update Channel Path Identifiers panel.

Once you are satisfied with the channel path assignment, press Enter, and you are returned to the Processor List panel.
4.4.3 Partition Numbers

During the EMIF feature upgrade of your processor, HCD assigns a partition number to each of the partitions in the alphabetical order of their names.

Select the processor from the Processor List panel, and the Work with partitions action from the context menu. The Partition List panel is displayed. See Figure 82.

![Partition List Panel]

Notice that the partition numbers when upgrading a processor to support EMIF are different than those assigned when defining the partitions one after the other in dialog mode. In the latter, if you do not specify a partition number, HCD assigns the partition number in chronological order; that is, the first partition defined gets partition number 1, the second partition gets partition number 2, and so on.

If you wish to change the partition number assignment, select a partition and the Change action from the context menu.

Note: If you are trying to reassign a partition to a number already assigned to another partition, you have to temporarily assign a dummy number to one partition to avoid duplicate partition numbers. For example, if you try to change LPTEST to partition 1, HCD issues message CBDA424I:

```
Partition number 01 already defined.
```

You have to temporarily reassign the LPPROD partition to an unassigned partition number. Change the LPPROD partition to partition 4 and then assign the LPTEST partition to partition 1. Now assign the LPPROD partition to partition 3. But be careful: this can destroy any definition with dependencies on partition numbers.
4.4.4 Channel Path Considerations

In an EMIF environment, a channel path can be shared among partitions. In contrast to DED and REC channels, a shared (SHR) channel path can have more than one partition in its access list. You can define which partitions will have access to a particular channel at activation time by placing the partition in the channel path access list. See Figure 83.

```
CBDPCH1A

Select one or more partitions for inclusion in the access list.

Channel path ID .. : 30   Channel path type . : CNC
Operation mode . . . : SHR   Number of CHPIDs .. : 8

/ Partition Name Number Usage Description
LPPROD  1   OS   LPAR for Production
7LPTEST  2   OS   LPAR for TEST

Figure 83. Define Access List Panel
```

Any combination of partitions may be selected from this list. It is not compulsory that any are selected. When you press Enter on the Define Access List panel, if any partitions remain unselected, then the Define Candidate List panel is displayed. See Figure 83.

```
CBDPCH1C

Select one or more partitions for inclusion in the candidate list.

Channel path ID .. : 30   Channel path type . : CNC
Operation mode . . . : SHR   Number of CHPIDs .. : 8

/ Partition Name Number Usage Description
LPPROD  1   OS   LPAR for Production

Figure 84. Define Candidate List Panel
```

Specify here the partitions to be in the candidate list.

The candidate list is a list of partitions to which the selected channel path may be varied online at some time after activation.

Note: HCD does not display on the candidate list any partition already selected as being on the access list.
4.4.5 Defining Shared Channel Paths

You define the shared ESCON channels to the configuration as follows:

1. Select the processor from the Processor List panel, and the \textit{Work with channel paths} action from the context menu.

2. Press \textit{F11} to add a new EMIF channel.

3. Complete the new channel details, specifying \textit{SHR}. Unless you have ESCON directors, you can ignore the dynamic switch ID, entry switch ID, and entry port details. The panel is shown in Figure 85.

\begin{verbatim}
CBDPOCH10

Specify or revise the following values.

Processor ID . . . : BLUESYS2  ES/9000 640
Configuration mode : LPAR

Channel path ID . . . . . . 24 +
Number of CHPIDs . . . . . 4
Channel path type . . . . . CNC +
Operation mode . . . . . . SHR +
Description . . . . . . . . . ________________________________

Specify the following values only if connected to a switch:

Dynamic switch ID . . . . . . __ + (00 ─ FF)
Enter switch ID . . . . . . . __ +
Enter port . . . . . . . . . . __ +
\end{verbatim}

\textit{Figure 85. Define Channel Paths}

For shared channels, you are now presented with two panels to define the access list and candidate list of partitions for the channels.

If you include all partitions in the access list, then you are not prompted for the candidate list. The access list is used only for the first POR using an IOCDS created from the IODF. All partitions in the initial access list are implicitly in the candidate list.

The access list selection is shown in Figure 86 and the candidate list selection is shown in Figure 87.

You select the desired partition with a \textbf{/}.
The Channel Path List panel (shown in Figure 88) is presented on completion of the access and candidate list selection.

Figure 86. Channel Path Access List

Figure 87. Channel Path Candidate List

Chapter 4. Common Tasks
4.4.6 Defining a 3990 on EMIF Channels

The configuration to be defined is shown in Figure 89. Changes made to the original configuration to reflect the new situation are as follows:

1. Change the processor support level to support EMIF (if not already done).
   4.4.2, “Upgrading the Processor” on page 68 describes how to do this.
2. Define the new EMIF channel paths to the configuration (if not already done).
   4.4.5, “Defining Shared Channel Paths” on page 72 describes how to do this.
3. Remove the attachment of the devices from one of the two logical 3990-3 Control Units.
4. Change the connection of control units to the EMIF channels.
5. Reconnect the devices to the second control unit.

This example shows both the definition of an EMIF configuration and how to migrate an existing control unit to EMIF without losing the information related to the operating system.

The original configuration is shown in Figure 17 on page 28.

---

**Figure 89. EMIF Shared Control Unit**

Assuming steps 1 and 2 from the previous list have been completed, you can now remove the connection of the devices attached to the control unit concerned, as follows:

1. Select I/O Devices from the Define Modify or View Configuration Data panel.
2. Use the `{` and `}` delimiters to select a range of devices to be disconnected, then select the **CSS group change** action from the context menu.

3. Delete the control unit numbers from the resulting Change Device Group panel for the devices (shown in Figure 90).

```
Change Device Group

CBDPDV50
Specify the control units the devices are attached to.
Connected to CUs .. 0001 0002 ___ ___ ___ ___ ___ __ +
```

*Figure 90. Change Device Group Panel*

You can now change the channel connection of the control unit from the original reconfigurable ESCON configuration to the new ESCON EMIF configuration, as follows:

1. Select **Control Units** from the Define, Modify or View Configuration data panel.
2. From the Control Unit List select the control units to be moved, and the **Change** action from the context menu.

   HCD displays the Control Unit Definition panel for each of the selected control units. See Figure 91.

```
Change Control Unit Definition

CBDPCU30
Specify or revise the following values.
Control unit number .... 0001 +
Control unit type ...... 3990-3 +
Serial number ........... 3990-3 DASD Controller
Description ............ 3990-3 DASD Controller
Connected to switches ...
Ports ................. -- -- -- -- -- -- +
```

*Figure 91. Change Control Unit Definition Panel*

3. Pressing Enter displays the Select Processor / Control Unit panel, (shown in Figure 92), where you can change the channel connections to the new EMIF CHPIDs.
Select processors to change CU/processor parameters, then press Enter.

Control unit number . . : 0001  Control unit type . . : 3990-3
(CUADD) + 1─ 2─ 3─ 4─ 5─ 6─ 7─ 8
  _ BLUESYS Yes _ 0B 06 0A 05 _____ _____ _____
  / BLUESYS2 Yes _ 22 23 _____ _____ _____ _____

Figure 92. Select Processor / Control Unit Panel

Finally, connect the devices back to the second control unit and specify whether there is any specific device eligibility to each of the partitions:

1. Select I/O Devices from the Define, Modify or View Configuration Data panel.
2. Select the range of devices from the I/O Device List panel, and the CSS group change action from the context menu.
3. Enter the control unit number as before, shown in Figure 93.

Specify the control units the devices are attached to.

Connected to CUs . .: 0001 0002 _____ _____ _____ +

F1=Help  F2=Split  F4=Prompt  F5=Reset  F9=Swap  F12=Cancel

Figure 93. Change Device Group Panel

4. Once the devices have been re-attached to the control unit, the Change Device Group / Processor Definition panel (shown in Figure 94) is displayed.
5. Specify Yes in the Explicit device candidate list field to allow the definition of candidate lists for the group of devices you are defining.

Select processors to change device/processor definitions, then press Enter.

/ Processor ID UA + Time-Out STADET Preferred Explicit Device
  _ BLUESYS 00 Yes Yes _ No
  / BLUESYS2 00 Yes Yes _ No

Figure 94. Select Processor for Device Changes
6. Press Enter to display the Define Device Candidate List panel, shown in Figure 95. Select the partitions that should have access to the devices. If individual devices have different candidate lists, specify the most common profile and go back later and change the less common ones.

![Define Device Candidate List Panel](image)

**Figure 95. Define Device Candidate List Panel**

**Note:** The Reachable column on the panel in Figure 95 indicates whether the device has (Yes), or does not have (No) a physical path to the appropriate partition.

### 4.4.7 Defining a Shared 3174 in an EMIF Environment

In SNA mode, an ESCON-attached 3174 can be configured with multiple logical control unit support. In this mode, each logical control unit may be associated with different images. Using an ESCON director, these images may be different processors in basic or LPAR mode, or different partitions on the same processor. EMIF can be used to connect the 3174 to multiple partitions on the same processor. Terminals on the 3174 can switch between up to five sessions.

The example here shows the definition of a 3174 to three partitions in the same processor using EMIF facilities. The configuration is shown in Figure 96, and the equivalent IOCP statements are in Figure 97. Note that these statements were taken from an IOCP input data set, created from HCD, and relate solely to the 3174 we are defining.
The IOCP statements for defining the 3174 configuration in Figure 96 are:

- Host BLUESYS:
  
  RESOURCE PARTITION=((LPDEV,3),(LPPROD,1),(LPTEST,2))
  CHPID PATH=(3C),SHARED,PARTITION=((LPPROD,LPTEST,LPDEV),(LPPROD,LPTEST,LPDEV)),TYPE=CNC

- This definition allows LPPROD to use the shared 3174:
  
  CNTLUNIT CUNUMBR=103C,PATH=(3C),UNITADD=((00,001)),CUADD=1,UNIT=3174
  IODEVICE ADDRESS=13C,UNITADD=00,CUNUMBR=(103C),STADET=N,PARTITION=(LPPROD),UNIT=3791L

- This definition allows LPTEST to use the shared 3174:
  
  CNTLUNIT CUNUMBR=203C,PATH=(3C),UNITADD=((00,001)),CUADD=2,UNIT=3174
  IODEVICE ADDRESS=23C,UNITADD=00,CUNUMBR=(203C),STADET=N,PARTITION=(LPTEST),UNIT=3791L

- This definition allows LPDEV to use the shared 3174:
  
  CNTLUNIT CUNUMBR=303C,PATH=(3C),UNITADD=((00,001)),CUADD=3,UNIT=3174
  IODEVICE ADDRESS=33C,UNITADD=00,CUNUMBR=(303C),STADET=N,PARTITION=(LPDEV),UNIT=3791L
The process described includes defining a shared CHPID to the hardware and allowing the three partitions to have access to it.

**Note:** The definition of the channel is not shown here, as this has been done before, and would normally be already defined to the processor.

The process you follow is:

1. Starting from the channel definition, define the three logical control units.
2. For each control unit, define the SNA device to the hardware and define which partition has access to it through the device candidate list.
3. Define each device to the operating systems so that each system may run in any partition.

Assume the CHPID you have chosen is 3C, which has been defined as shared with all partitions on its access list. You now define each logical control unit as follows:

1. Select a channel from the Channel Path List panel in Figure 98, and the **Work with attached control units** action from the context menu. This displays the list of control units for the channel path shown in Figure 99.

![Figure 98. Select Control Units on Channel Path](image)

2. Press F11 to add a Control Unit.
3. Complete the control unit details as shown in Figure 100.

![Figure 99. Empty Control Unit List for CHPID 3C](image)
Change Control Unit Definition

<table>
<thead>
<tr>
<th>CBDPCU10</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify or revise the following values.</td>
</tr>
<tr>
<td>Control unit number . . . . 103C +</td>
</tr>
<tr>
<td>Control unit type . . . . . 3174 +</td>
</tr>
<tr>
<td>Serial number . . . . . . .</td>
</tr>
<tr>
<td>Description . . . . . . . . 3174 EMIF control for LPAR 1</td>
</tr>
<tr>
<td>Connected to switches . . .</td>
</tr>
<tr>
<td>Ports . . . . . . . . . . . .</td>
</tr>
</tbody>
</table>

If connected to a switch, select whether to have CHPIDs/link addresses, and unit address range proposed.

Auto-assign . . . . . . . 2 1. Yes 2. No

Figure 100. First 3174 Control Unit for LPPROD

4. Pressing Enter displays the Select Processor / Control Unit panel shown in Figure 101. The CHPID is already inserted, but you have to complete the other control unit details.

5. Select the processor and the **Select (connect, change)** action from the context menu.

Select Processor / Control Unit

<table>
<thead>
<tr>
<th>CBDPCUPO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select processors to change CU/processor parameters, then press Enter.</td>
</tr>
<tr>
<td>Control unit number . : 103C Control unit type . : 3174</td>
</tr>
</tbody>
</table>

/ Proc. ID Att. Log. Addr. ______Channel Path ID . Link Address + ______ (CUADD) + 1 2 3 4 5 6 7 8

- BLUESYS
- BLUESYS2

*************************************************************************** Bottom of data **************************************************************************

Figure 101. Select Processor / Control Unit Panel

6. Complete the configuration attachment details. Assume you have chosen a unit address of X’00’ for the base address of the attached device (only one for this non-gateway SNA control unit). The logical address has to be unique on the channel; suppose you have chosen 1 for this first CU.

7. Pressing Enter returns you to the Select Processor / Control Unit panel, but now you see the Att field is Yes and the Logical Address is 1.

8. Press Enter again to return to the Control Unit List panel.

9. Select the control unit again and the **Work with control units** action from the context menu. The empty device list is shown in Figure 102.
10. Press F11 to add a new device and complete the details as shown in Figure 103. The control unit number is already entered for you.

```
Figure 103. SNA Device Definition on First 3174

11. Pressing Enter displays the Device / Processor Definition panel. Select a processor and press Enter. This is shown in Figure 104.

```

```
Figure 104. Connect to Processor

12. On the resulting Define Device / Processor panel, specify unit address 00, and specify Yes in the Explicit device candidate list field as shown in Figure 105.

```
Figure 105. Specify Explicit Device Candidate List

13. The device candidate list limits access to this device on the control unit (logical address 1) to one partition, but you should define the device to all the operating systems to allow any operating system to run in any partition. The Define Device Candidate List panel is shown in Figure 106.

Figure 106. Define Device Candidate List Panel

14. Pressing Enter returns you to the Device / Processor Definition panel. Pressing Enter again allows you to define the device to the operating systems, shown in Figure 107.
Select OSs to connect or disconnect devices, then press Enter.

Device number : 013C  Number of devices : 1
Device type : 3791L

/ Config. ID Type Description Defined
/ OSPROD MVS Production System
/ OSTEST MVS Test System
*****************************************************************************

Figure 107. Define Device to the Operating Systems

15. Select an operating system and the Select (connect, change) action from the context menu. For each selected operating system, you are prompted for device features and EDT selection. The Define Device Parameters / Features panel is shown in Figure 108.

Specify or revise the values below.

Configuration ID : OSPROD  Production System
Device number : 013C  Number of devices : 1
Device type : 3791L

Parameter/ Value  P Req.  Description
Feature
OFFLINE  No  Device considered online or offline at IPL
DYNAMIC  Yes  Device supports dynamic configuration
OWNER  VTAM + Subsystem or access method using the device
*****************************************************************************

Figure 108. Define Device Parameters / Features Panel

16. The List of EDTs panel is shown in Figure 109 with all esoterics defined. We do not want to add this device to DASDA. Press Enter.
17. After the devices are defined to the operating systems, pressing Enter returns you to the I/O Device List panel. You exit from this panel by pressing F3. You are returned to the Control Unit List panel from where you can define the other logical control units for this 3174.

The entire definition process, from the logical control unit to the EDT, has to be repeated for each logical control unit you want to define. You should define a logical control unit for every partition that requires access and for partitions in other processors that need the 3174 attached through a switch up to the 3174 SNA maximum of eight.

### 4.5 Defining a Coupling Facility Configuration

This section describes the steps required to define the hardware portion of a configuration that contains a coupling facility.

#### 4.5.1 Coupling Facility (CF)

The coupling facility is a new architecture that provides very fast storage and communication functions to MVS. The coupling facility is Coupling Facility Control Code (CFCC), which runs in a logical partition, in place of an operating system. This partition can be defined in a 9674, 9672, 9021, or 9121 central processor complex (CPC). This partition can be defined in a 9121 only when using the Integrated Coupling Migration Facility (ICMF). The coupling facility, along with other MVS images, make up a parallel sysplex environment. The coupling facility performs two fundamentally different functions. First, it receives requests from MVS and returns responses to those requests. Secondly, it provides a cross system communication facility needed to implement a parallel sysplex.

A partition is enabled for CF support by selecting a new operating mode of CF. This mode is set in HCD (for configuration validation), and at the processor hardware console under partition mode. In CF mode the partition is limited to running the CFCC, and cannot IPL and run system control programs (SCP) such as MVS or VM. When a CF partition is activated, the CFCC is loaded directly into the partition’s minimum 8MB of central storage.

The only CHPIDs used by the CF are coupling facility receiver (CFR) type CHPIDs. (There may be some CNC type defined, but they are used to connect
I/O for diagnostic purposes only.) These CFR CHPIDs can only be connected to coupling facility sender (CFS) type CHPIDs. The CFS CHPIDs are defined to CPCs that have MVS (5.1 or higher) running.

A configuration that includes a coupling facility requires the following steps be performed, using HCD:

• Define processors that support CF partitions, OS partitions, or both
• Define CF and OS partitions
• Define CFR CHPIDs
• Define CFS CHPIDs
• Connect the CFR and CFS CHPIDs

Using the configuration shown in Figure 110, the rest of this section describes the steps to configure coupling facilities with HCD. The process shown details one example of each of the four steps required to fully define the configuration. In order to complete a configuration, these steps have to be repeated as required.
4.5.2 Defining the CPC

In the configuration, there are two CFs. Each one is in a different CPC, which is part of a 9672-E03. One CPC, which will be used for a CF, will be defined here.

The CPC is defined as follows:

1. On the primary task selection panel, select Define, Modify or View Configuration Data, and on the resulting panel, select the object Processors. HCD displays the processor list of all processors currently defined in the IODF. Use F11 to add a new processor.
2. The Add Processor panel is displayed. Enter the information requested for the CPC. Make sure the LPAR configuration mode is selected for CPCs that will contain CFs as the CF can only operate in a logical partition. The Add Processor panel is shown in Figure 111.

Optional information includes the serial number, description, and the SNA address. The serial number must be ten hexadecimal digits, with the first six digits equal to the CPC serial number, and the last four digits equal to the processor type. You choose the CPC serial number when defining a 967X processor. If this information is included when defining a 9X21 CPC, an IOCDS cannot be written to the PCE when the serial number specified here does not match the real serial number of the CPC.

The SNA address should be specified, but only if defining a 967X CPC. This will allow HCD to communicate with the Support Element (SE) of the CPC, even though HCD may not be running in a MVS image in the CPC. The HCD functions that require this communication are IOCDS updates, and IPL parameter updates. The prompt for the SNA fields will list the currently configured CPCs (with network name and CPC name), from the Hardware Management Console (HMC). The HMC must be available to the CPC in which HCD is running. The SNA address is made up of the network name and the CPC name. The network name is the eight-character (maximum) alphanumeric network identifier of the LAN to which the SE of the CPC is connected. The CPC name is the eight-character (maximum) alphanumeric identifier of the SE of the CPC within the network. If the network name is specified, and the CPC name is not, then it will default to the processor ID.

3. Press Enter.

4. Depending on the processor type and model, there may be more than one support level for the processor type. The support level defines the supported channel path types, and the features such as Dynamic I/O Reconfiguration, EMIF and coupling facility support. If the processor has several support levels, HCD displays another panel showing a list of available support levels for the processor. If there is not more than one (as with 967X processors), then this step will not occur. There is more information to the right on the panel to explain the levels. Select the appropriate support level by placing
the cursor next to it, and pressing Enter. The Available Support Levels panel is shown in Figure 112.

![Available Support Levels Panel](image)

Figure 112. Available Support Levels Panel

5. The updated Processor List panel is displayed.

### 4.5.3 Defining the CF Partition

The CF partitions must now be defined. They are defined by working with the previously defined CPCs. One CF partition will be defined here.

The CF partition is defined as follows:

1. On the Processor List panel, select the processor and the **Work with partitions** action from the context menu (or action code `#`).

   The Partition List panel is displayed. It may contain a list of partitions, if some have already been defined to the CPC.

2. Press F11 to add a partition. The Add Partition panel is displayed. Enter the information for the partition to be defined. Make sure that you specify CF for the partition usage. This will allow HCD to perform complete validation checks. You can also select CF/OS for partition usage, but some of the validation checks will not be performed, in regards to the types of channels accessed by the partition. As with all partition usage, the actual usage selection is made at the hardware console for the processor. The Add Partition panel is shown in Figure 113.

![Add Partition Panel](image)

Figure 113. Add Partition Panel

3. The updated Partition List panel is displayed after Enter is pressed.
4.5.4 Defining the CHPIDs

The CFR and CFS CHPIDs are defined by working with the previously defined CPCs. First, some of the CFR CHPIDs will be defined here, and then some of the CFS CHPIDs, although it does not matter which order you choose.

The CFR CHPID is defined as follows:

1. On the Processor List panel, select the processor and the **Work with attached channel paths** action from the context menu (or action code 5). The Channel Path List panel will be displayed with no CHPIDs listed, unless some have been defined previously.

2. Press F11 to add a CHPID. The Add Channel Path panel is displayed. Enter the information for the CHPIDs to be defined. The CHPID type will be CFR and the operation mode must be DED. This type of channel cannot connect to a switch. You may define more than one CFR CHPID on this panel by changing the number of CHPIDs entry, as long as they are consecutive, and will all be accessed by the same partition. The Add Channel Path panel is shown in Figure 114.

![Add Channel Path Panel](image)

3. Press Enter.

4. The Define Access List panel is displayed. The access list specifies which partitions can access a CHPID after the completion of the POR. A CFR CHPID can only be accessed by one partition. Select the partition to add the CHPIDs to by placing a /SF590000/ next to the partition name. The Define Access List panel is shown in Figure 115.

![Define Access List Panel](image)

5. Press Enter.

6. The updated Channel Path List panel is displayed.

**Note:**

CFR CHPIDs are not dynamic. It will require a POR using a new IODF to add or delete them once a CPC has performed a POR.

The minimum configuration for a processor requires at least one CHPID, one control unit, and one device. When a processor has only CFR CHPIDs defined to it, this requirement is dropped.
The CFS CHPID is defined as follows:

1. On the Processor List panel, select the processor and the Work with attached channel paths action from the context menu (or action code /SF590000 s /SF580000).

The Channel Path List panel will be displayed.

2. Press F11 to add a CHPID. The Add Channel Path panel is displayed. Enter the information for the CHPIDs to be defined. The CHPID type will be CFS and the operation mode will depend on how it is to operate. Modes of operation only apply to CHPIDs defined to a CPC that is operating in LPAR mode.

Whereas CFR CHPIDs can only be dedicated, CFS CHPIDs can operate like CNC or CTC type CHPIDs. They can operate as dedicated, reconfigurable, or shared. Dedicated means the CHPID can only be accessed by one partition, as specified in the access list. Any change to which partition it is accessed by would require the activation of an IODF with the change (this does not apply to CFR CHPIDs). Reconfigurable means that the CHPID can only be accessed by one partition at a time, but it can be changed by use of the CONFIG command, either at the hardware console, or under MVS. The access list specifies which partitions have access to the CHPID after completion of the POR. Any other partitions that can access the CHPID by use of the CONFIG command will be in the candidate list. Shared means that the CHPID can be accessed by more that one partition at the same time (EMIF). The access list will specify which partitions can access the CHPID after POR, while the candidate list will specify which other partitions can access the CHPID by use of the CONFIG command. For details refer to MVS/ESA SP V5 System Commands.

Since CFS CHPIDs only connect to CFR CHPIDs, they cannot be connected through a switch. You may define more than one CFS CHPID on this panel by changing the number of CHPIDs entry, as long as they are consecutive.

The Add Channel Path panel is shown in Figure 116.
3. Press Enter.

4. The Define Access List panel is displayed. Select the partitions to add the CHPIDs to by placing a / SF590000/ SF580000 next to the partition names. The number of partitions that can be selected will depend on the operation mode selected on the previous panel. The Define Access List panel is shown in Figure 115.

5. Press Enter.

6. Depending on what was selected on the previous panel, and the operation mode selected for the CHPIDs, the Candidate List panel may be displayed. Make the selections with a / SF590000/ SF580000 next to each partition to be selected if it does appear. Although it is not shown here, it is very similar to the Define Access List panel shown in Figure 115. Press Enter if it did appear.

7. The updated Channel Path List panel is displayed.

4.5.5 Connect the CFR/CFS CHPIDs

The last step in the process is to connect the CFR CHPIDs and CFS CHPIDs. Because there are usually fewer CF partitions than MVS images, it is easier to connect the CFR CHPIDs to CFS CHPIDs, rather than CFS CHPIDs to CFR CHPIDs. One group of CFR CHPIDs will be connected here.

All CFR and CFS CHPIDs to be connected must be defined in the current IODF before the CHPIDs can be connected. Only one connection can be specified for a CFR or CFS CHPID.

The CFR CHPID is connected to the CFS CHPID as follows:

1. On the Processor List panel, select the processor and the Work with attached channel paths action from the context menu (or action code $).
2. The Channel Path List panel will be displayed. If the list contains CHPIDs that are already connected, you may want to filter the list by using the filter action, and selecting CF Connected = N. The list will now contain only CHPIDs that are not connected.

3. On the Channel Path List panel, select the CHPIDs and the Connect CFR/CFS channel paths action from the context menu (or action code SF590000). 

4. The CFR / CFS Channel Path Connectivity List panel will be displayed. The CFR / CFS Channel Path Connectivity List panel is shown in Figure 118.

5. On the CFR / CFS Channel Path Connectivity List panel, select the CHPIDs and the Connect to CFR/CFS channel path action from the context menu (or action code SF590000), as shown in Figure 118.

6. The Connect to CFR/CFS Channel Path panel is displayed. Enter the destination processor ID and CHPID information for your configuration. The CHPID must be a CFS type. Use of the prompt function makes the entry
process easier on this panel. Prompt at the destination processor ID field will display the list of defined processors with CFS CHPIDs that are not connected. You should make this selection first. Prompt at the destination channel path ID field will display the list of CFS CHPIDs that are not connected on the selected destination processor. Select the one that matches the configuration. The Connect to CFR/CFS Channel Path panel is shown in Figure 119.

![Connect to CFR/CFS Channel Path Panel](image)

**Figure 119. Connect to CFR/CFS Channel Path Panel**

7. Press Enter.

8. The Add CF Control Unit and Devices panel is displayed. In order for MVS to communicate with the CF, MVS requires that I/O be defined for it. There is now a new type of I/O called CFS control unit and CFS device. They must be defined to all CPCs that are running MVS, and will be connected to a CF. This panel provides the input for these definitions.

The information on this panel is automatically entered by the connect function, as proposed by HCD. It will specify a CFS control unit and two CFS devices (consecutively numbered), which together will be the I/O for the CFS CHPID. They cannot be changed once they are defined. This is indicated by a [ ] in the action entry field on the Control Unit List panel and I/O Device List panel, for all CFS type I/O. There are no CFR type control units or devices defined.

There is one control unit defined for every CPC that connects to a CF. The CFS control unit can have a maximum of eight CHPIDs (connections) defined to it. Each CHPID connected to a CFS control unit will have two devices defined to the control unit. HCD will select the default values for both the control unit and device numbers as the highest available of each, starting at X'FFFFE' and working downwards. These values can be changed if there is no other connection defined from the OS partition to the CF. If a connection already exists, then the new connection must use the same control unit number (it cannot be changed), but a change to the device number is allowed. It should not be necessary to change the default values. There are no entries for defining any parameters for CFS control units and devices. HCD provides no other way of connecting CFR and CFS CHPIDs, or of defining the CFS I/O (APAR OW12423 allows the definitions to be created via migration). There are no UIMs required for the coupling facility support. The Add CF Control Unit and Devices panel is shown in Figure 120.
Add CF Control Unit and Devices

CBPDCF11

Confirm or revise the CF control unit number and device numbers for the CF control unit and devices to be defined.

Processor ID . . . . : 982
Channel path ID . . . : 70 Operation mode . . : SHR
Control unit number . . FFFE +
Device number . . . . : FFFA
Number of devices . . : 2

Figure 120. Add CF Control Unit and Devices Panel

9. Steps 6, 7, and 8 will be repeated for each CHPID that was selected to be connected. When all the CHPIDs are connected, the updated CFR/CFS Channel Path Connectivity List panel is displayed, as shown in Figure 121. Note, that the destination columns now show the connections to the CFS channels paths.

Figure 121. CFR / CFS Channel Path Connectivity List Panel

10. Press F12 to leave the list.

If a correction is required to the connection list, the disconnect function is available by placing a /SF590000 next to a CHPID on the CFR/CFS Channel Path Connectivity List panel. This will disconnect the CHPIDs, delete the control unit (if it is the last path), and delete the two devices that were defined for that connection. Now a new connection can be specified for the CHPID.

Connections are dynamic, so that the activation of an IODF which would add or delete CFS control units or devices is allowed.

If using the repeat processor function, the connections are not duplicated in the new processor. This allows the repeat function to complete without any errors. You must then connect the CF CHPIDs in the new processor.

The graphical configuration report function is available to view or print the configuration once it is complete.
4.5.6 HCD Coupling Facility Definitions and IODF Considerations

It is required that each MVS LPAR definition or basic mode definition be in the same IODF as the definition of a coupling facility (CF) image to which the MVS is connected. That is, each CFS channel must be in the same IODF as its corresponding CFR channel. There are several reasons for this requirement:

- If the MVS processor definition and the CF definition are not in the same IODF, HCD is unable to define the connection between the CFS channel on the MVS side and the CFR channel on the CF side. Hence, HCD is unable to generate the CF control unit and device definitions for the CFS channels.
- HCD cannot ensure that the control unit numbers used for the CF control unit and the device numbers used for the CF devices are not yet used for the MVS processor.

As a result of the above requirement, it is strongly recommended that all MVS processors and the connected coupling facilities be defined in a single IODF.

If it becomes necessary to define a CF connection between an MVS processor and a CF processor that are not defined in the same IODF, an additional CF processor must be defined.

Let us assume that IODF01 contains a processor, PROC1, with one or more CFS channel paths defined. Also assume that IODF02 contains a processor, PROC2, with one or more CFR channel paths defined in LPAR CF2. Each CFS channel path is to be connected to a CFR channel path. The connections cannot yet be defined, as the CFS and CFR channel paths are in different IODFs. Figure 122 shows this configuration.

![Figure 122. CFS Cannot Be Connected to CFR](image)

The following steps illustrate how to achieve the desired CFS to CFR connectivity:

1. Define processor PROC2 with coupling facility partition CF2 in IODF01. Use the same processor type as PROC2 in IODF02.
2. Define the CFR channel paths that are to be used for the CF connection.
3. Connect the CFR channel paths of PROC2 to the CFS channel paths in PROC1 within IODF01. This allows HCD to generate the necessary CF control unit and CF device definitions.

Figure 123 shows the updated configuration.
4.6 Preparing for Production

This section discusses the verification of HCD-defined configurations in preparation for IPL or dynamic activation. The topics covered are:

- Creating a production IODF
- Downloading an IOCDS
- Creating an IOCP input deck
- Creating input for the JES3 INISH stream checker
- Creating an HCPRIO deck

4.6.1 Creating a Production IODF

Although HCD validates the data when it is entered, there are cases where HCD is not able to perform a complete validation as data may not be defined at the time (for example, a complete path from processor to device for the switch path validation). This type of validation is done at “Production IODF Build” time. The creation of a production IODF validates the definitions in the source work IODF. The production IODF is not created if any errors with a severity higher than warning are produced.

The process to create a production IODF is as follows:

1. Enter the name of the work IODF from which you wish to create a production IODF on the HCD primary menu, and Activate or Process Configuration Data.

2. Select Build production I/O definition file from the Activate or Process Configuration Data panel, shown in Figure 124.
3. HCD validates the work IODF content and displays appropriate messages if there are incorrect or incomplete definitions. For example:

- No link address specified for the control unit/channel path connection when the channel path ID is defined as operating through a dynamic switch (port).

- The maximum protocol for a control unit is not selected.

The messages are presented to the user using the Message List panel.

A sample of the Message List panel is shown in Figure 125. Should you require more information about any of the messages, select a message and the Explain action from the context menu. The explanation provided may also be read in MVS/ESA Hardware Configuration Definition: Messages. A sample is shown in Figure 126.

Select SAVE from the action bar for the output to be saved into a dataset.
CBDY7C22

CBDO081I No console devices defined for operating system configuration NEWMVS.

Explanation:
At least one console device must be defined for each VM operating system. For an MVS operating system console devices are not required and this message is only a warning.

System Action:
System waits for user action.

User Response:
If the indicated operating system configuration is of type VM define console device.

Figure 126. Sample Error Message Explanation

Review the messages, make corrections if required, and then repeat the process of building the production IODF from the work IODF.

4. If activity logging has been requested, the panel shown in Figure 127 is presented.

Enter the activity logging details that your installation requires.

Figure 127. Activity Log Panel - Installation Dependent Data

When all the activity log details have been entered, press F3 to continue.

5. If no severe error is detected, HCD continues and prompts you for the production IODF name.

The new production IODF must reside on a DASD volume that is accessible from all system images that must be supported by this IODF (the MVS/ESA IPL process also requires access to the IODF device). If not all the required system images can access this IODF volume, use the HCD copy function to copy the production IODF to a DASD volume that can be accessed from the
other systems. Or you may use the EXPORT function to send the production IODF to the necessary systems, where it may be received and imported.

The EXPORT and IMPORT functions are provided by HCD, and may also be used to distribute a production IODF created at V5 level of HCD to a system running at a lower level, and use that IODF for IPL.

A production IODF must be cataloged on each MVS/ESA system that is required to support dynamic I/O reconfiguration activation. HCD automatically catalogs the new production IODF, using the catalog structure for that system. HCD also catalogs any copies that are made by the HCD copy function, or the HCD IMPORT function.

On the HCD Build Production I/O Definition File panel (Figure 128), enter the:

- New production IODF data set name
- Volume serial number where the IODF will reside
- Option 1 or 2 for the IODF that you want to continue using

HCD does not allow you to create a production IODF with a name that already exists. If you are not using SMS to manage IODF allocations, you must specify the volume on which to place the IODF (remember it must be accessible from all the systems that use this IODF to IPL from). If you operate in an SMS environment, and allow SMS to manage the placement of the production IODF, it is essential that you ensure that the production IODF and SYSn.IPLPARM are located on the same volume. ACS routines should be modified to ensure these data sets are placed on the correct volume.

HCD checks if you wish to continue using the work IODF, or the new production data set. If you intend to proceed with other tasks to prepare for production, it is recommended that you select 2 to switch the currently accessed IODF to the newly built production IODF (Figure 128 shows this).

```
Build Production I/O Definition File

Specify the following values, and choose how to continue.

Work IODF name . . . : 'SYS4.IODF00.WORK'
Production IODF name . 'SYS4.IODF00'
Volume serial number . TOTTS1 +

Continue using as current IODF:
2 1. The work IODF in use at present
   2. The new production IODF specified above
```

Figure 128. Defining the Production IODF

6. You are then requested to provide the contents of the two optional Descriptor Fields. These descriptor fields are included in the hardware configuration token. They are not part of the comparison with the processor token. The HCD default values are the first two qualifiers of the IODF data set name. Installations may decide for themselves what the values of these fields should be, but it is recommended that the defaults be used. This is especially important when using the "***" specification in LOADxx for selecting an IODF.
The displayable portion of the processor token (includes the descriptor fields) is shown in the:

- MVS/ESA command D IOS,CONFIG display
- ES/9000 display frame IOCDSM - option D1
- HCD View Processor Definition panel, field 'Processor token'

The default values for the two descriptor fields can be used as a quick check later to determine whether the hardware and software are synchronized. The panel is shown in Figure 129.

```
<table>
<thead>
<tr>
<th>Define Descriptor Fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBDDUT73</td>
</tr>
<tr>
<td>Specify or revise the following values.</td>
</tr>
<tr>
<td>Production IODF name . : 'SYS4.IODF98'</td>
</tr>
<tr>
<td>Descriptor field 1 . . . SYS4</td>
</tr>
<tr>
<td>Descriptor field 2 . . . IODF98</td>
</tr>
</tbody>
</table>
```

Figure 129. IODF Descriptor Fields

7. Enter the descriptor field values or leave the HCD default values, then press Enter to begin building the new production IODF. Building the production IODF may take several minutes.

8. HCD informs you when the building of the production IODF has been completed and returns to the Activate Configuration Data panel. Figure 130 shows the result of the successful creation of a production IODF.

```
<table>
<thead>
<tr>
<th>Activate or Process Configuration Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBPDHW20</td>
</tr>
<tr>
<td>Select one of the following tasks.</td>
</tr>
<tr>
<td>1. Build production I/O definition file</td>
</tr>
<tr>
<td>2. Build IOCDS</td>
</tr>
<tr>
<td>3. Build IOCP input data set</td>
</tr>
<tr>
<td>4. Create JES3 initialization stream data</td>
</tr>
<tr>
<td>5. View active configuration</td>
</tr>
<tr>
<td>6. Activate configuration dynamically</td>
</tr>
<tr>
<td>7. Activate configuration sysplex-wide</td>
</tr>
<tr>
<td>8. Activate switch configuration</td>
</tr>
<tr>
<td>9. Save switch configuration</td>
</tr>
<tr>
<td>10. Build HCPRIO input data set</td>
</tr>
<tr>
<td>11. Build and manage S/390 microprocessor IOCDSs and IPL attributes</td>
</tr>
</tbody>
</table>

Production IODF SYS4.IODF00 created.
```

Figure 130. Successful Production IODF Creation

You may also create a production IODF using the HCD batch facility. The following shows an example.

**Note:** The batch function of building a production IODF requires that the work IODF and the target IODF must exist and are known to HCD by their DDNAMEs. This allows you to replace an existing production IODF.

**Attention:** Make sure that you do not overwrite your active production IODF.

### 4.6.2 Downloading an IOCDS

Once the production IODF has been created, you can build an IOCDS (I/O configuration data set). The IOCDSs exist on the Support Element DASD. A particular IOCDS is used at POR to inform the channel subsystem about the configuration.

**Note:** Where the IOCDS cannot be downloaded using HCD, an IOCP input data set should be built, and the stand-alone IOCP program used to build the IOCDS.

HCD provides a function called IOCDS download to write the configuration from a processor point of view into an IOCDS.

The method of downloading the IOCDS varies depending on whether the processor has its own SNA address. For example, if you have a S/390 microprocessor cluster where the Support Elements are defined with a SNA address, then refer to 9.4.1, “Build S/390 Microprocessor Cluster IOCDSs” on page 256.

Otherwise proceed as follows:

1. On the HCD primary menu, enter the name of the production IODF from which you wish to create the IOCDS. Select **Activate or process configuration data**. This displays the panel shown in Figure 124 on page 97.

2. Select **Build IOCDS**. This displays the Processor List panel shown in Figure 131.

3. Select the processor concerned with a **✓**, and the IOCDS List panel shown in Figure 132 is displayed.
4. Select the IOCDS in question with a /, and the Update IOCDS action from the context menu. On the Build IOCDS panel shown in Figure 133, supply the title which will be written to the first header line of the IOCP input data set, and specify whether the IOCDS is to be updated on both sides of a physically partitioned processor (Dualwrite).

Modify the job statement to meet your installation requirements.

5. Complete the panel and press Enter. The Download IOCDS job will be submitted. In a multi-system environment, make sure that the job runs on the processor designated for the IOCDS.

The Build job requires exclusive access to the production IODF data set. The same IODF data set is allocated to your TSO session. This results in the Build job waiting for the IODF data set contention to be resolved. You must either exit from your HCD session, or change the currently accessed IODF, to allow the contention to be resolved. The following message from the MVS console shows the IODF data set contention.
You can use the MVS/ESA command `D GRS,C` to determine the cause of the IODF data set contention (Figure 124).

When the IOCDS write job has completed, verify from the job output that it completed successfully. The following message should be shown in the job output:

```
IXP057I IOCDS JOB WIOCDS SUCCESSFUL. LEVEL AB4 IOCDS REPLACED.
```

No IOCP report listing will be provided when the program is invoked by HCD. Use the HCD report function to obtain any required reports.

You may change the JCL procedure that is used by the IOCP job, for example, to always print the IOCP output. The name of the JCL procedure is CBDJIOCP and that is stored in SYS1.PROCLIB.

### 4.6.3 Creating an IOCP Input Data Set

The stand-alone IOCP program does not support direct access to the production IODF, so you will need to first create an IOCP input data set as input if you need to run the IOCP program. HCD has a utility function for creating such a sequential file, which you can then transfer to tape or diskette. You can create this IOCP input data set only from a production IODF.

Stand-alone IOCP may be required if you have a processor that doesn’t support building of its IOCDS via HCD, to IPL a system on which HCD hasn’t yet been configured, or even as a backup if you should ever lose the support element/service processor copy.

Use the following procedure to build an IOCP input data set:
1. On the HCD primary menu select **Activate or Process configuration data**.
2. On the resulting panel, select **Build IOCP input data set**.
3. On the Available Processors panel, select the processor for which you want to build the IOCP input data set (the panel is shown in Figure 135).
4. On the Build IOCP Input Data set panel, shown in Figure 136, complete the
details and modify the job statement as required.

5. Press Enter to build the IOCP input data set. The IOCP input data set is
allocated automatically if it does not exist.

6. If the IOCP data set already exists, HCD asks for confirmation before
overwriting it. The panel is shown in Figure 137.
Confirm Replace Data Set

The data set specified already exists. To confirm replacement of the data set, select Yes. To cancel the replacement, select No.

Data set name . : ‘NL24771.IODF98.IOCP’

Replacement confirmed . . . 1 1. Yes 2. No

Figure 137. Confirm Replace Data Set Panel

7. Pressing Enter submits the job to create or modify the IOCP input data set.

An alternate way to create the IOCP input data set is using a batch job. In this case, the data set must be pre-allocated. Please refer to MVS/ESA Hardware Configuration Definition: User’s Guide for details. The IOCP input data set must:

- Have fixed-length, blocked, 80-character records
- Be either a sequential data set or a member of a partitioned data set

The following sample job allocates a sequential data set (NL24771.IODF98.IOCP) and then calls HCD to write an IOCP input data set to the sequential data set from NL24771.IODF98 for the processor ID BLUESYS:

```plaintext
//NL24771A JOB (ACCOUNT),'WERNER',REGION=4M,MSGCLASS=X,MSGLEVEL=1
//CREATE EXEC PGM=IEFBR14
//DD1 DD DSN=NL24771.IODF98.IOCP,LRECL=80,RECFM=FB,
//     BLKSIZE=3120,SPACE=(TRK,(1,1)),UNIT=SYSDA,DISP=(,CATLG)
//SYSPRINT DD SYSOUT=*,BLKSIZE=6650,LRECL=133,RECFM=FBA
//*
//IOCP EXEC PGM=CBDMGHCP,PARM='IOCDS,,BLUESYS,D'
//HCIDIODFS DD DSN=SYS4.IODF98,DISP=SHR
//HCDDDECK DD DSN=NL24771.IODF98.IOCPS,DISP=SHR
//HCDCNTL DD *
MSG1
/*
```

Another way is to write the IOCP data set directly to tape, as shown in the following example:

```plaintext
//NL24771A JOB (ACCOUNT),'WERNER',REGION=4M,MSGCLASS=X,MSGLEVEL=1
//IOCPS EXEC PGM=CBDMGHCP,PARM='IOCDS,,BLUESYS,D'
//HCIDIODFS DD DSN=SYS4.IODF98,DISP=SHR
//HCDDDECK DD DSN=NL24771.IODF98.IOCPS,DISP=SHR
//HCDCNTL DD *
//This is a backup IOCP input data set
/*
```

4.6.4 Creating Input for JES3 Initialization Stream Checker

The input data set for the JES3 initialization stream checker can be created from a MVS operating system definition. Although this data set can be created from a work IODF, it is recommended that a work IODF not be used to ensure that the same information is used for both IPL and the creation of the JES3 INISH stream.
checker data set. Use the following procedure to create the JES3 INISH stream checker data set:

1. On the HCD primary menu, specify the name of the IODF that you wish to create a JES3 INISH stream checker data set from, and select **Activate or process configuration data.**

2. Select **Create JES3 initialization stream data** from the Activate or Process Configuration Data panel shown in Figure 124. This displays the panel in Figure 138.

3. Enter the name of the JES3 INISH stream checker data set, the MVS configuration ID, and the EDT ID, and press Enter. The data set will be dynamically allocated if not currently available and HCD prompts you before overwriting an existing data set.

   ![Create JES3 INISH Stream Checker Data](image)

   Figure 138. Create JES3 INISH Stream Checker Data

4. HCD returns you to the Activate or Process Configuration Data panel and issues the successful completion message.

### 4.6.5 Creating an HCPRIO Deck

For VM-based systems, HCD can be used to create the HCPRIO data set for VM system generation. This allows for consistency when VM and MVS systems share common I/O, or co-exist on the same processor. VM/ESA 1.2 running in an partition alongside a dynamically capable MVS system can tolerate hardware configuration changes initiated by the MVS system, although VM itself cannot initiate the changes. (With VM/ESA 2.1, VM has a dynamic reconfiguration capability).

An HCPRIO deck is generated as follows:

1. On the HCD primary menu, specify the name of the production IODF from which you wish to create the HCPRIO data set. Select **Activate or process configuration data.**

2. Select **Build HCPRIO input data set** from the Activate or Process Configuration Data panel shown in Figure 124 on page 97. This displays the panel in Figure 139 on page 107.

3. HCD prompts you for the VM configuration ID and the output data set name for the HCPRIO data as shown in Figure 139. This data set is dynamically allocated. HCD prompts you before overwriting an existing data set.
4. HCD returns you to the Activate or Process Configuration Data panel and issues the successful completion message.

An alternate way to create an HCPRIO input data set is by using the HCD batch function. See the following example:

```
//CURRANB JOB (ACCOUNT), 'CURRAN', REGION=4M, MSGCLASS=X, MSGLEVEL=1
//HCPRIO EXEC PGM=CBDMGHCP, PARM='VMBUILD,H,VMTEST'
//HCDIODFS DD DSN=SYS4.IODF02, DISP=SHR
//HCDDECK DD DSN=CURRANB.HCPRIO, DISP=OLD
//HCDMLOG DD DSN=CURRANB.HCD.LOG, DISP=OLD
```


### 4.7 Producing Configuration Reports

With HCD you can create and print the following reports about the configuration data in an IODF:

- Channel Subsystem (CSS) Report
- Switch Report
- Operating System (OS) Report
- CTC Connection Report

These reports give you a printed overview of your configurations.

You can create or build reports either with HCD panels or batch jobs. Examples of using the HCD dialog to create reports are in 4.7.5, “Printing Reports Using HCD Panels” and an example using batch jobs is in 4.7.6, “Printing Report for Supported Hardware in Batch” on page 110.

#### 4.7.1 Channel Subsystem Report

The Channel Subsystem Report contains all configuration data that is used by the channel subsystem. This consists of data, in summary and detail, about your processors, partitions, IOCDS, CHPIDs, switches, control units, and I/O devices.

If you have more than one processor defined in your IODF, you can limit the report to the data for one processor or partition. When limiting the report to one partition, only those channels are reported that have the designated partition in
their access list. Likewise, only control units and devices that can be reached through these channels are reported.

4.7.2 Switch Report
The Switch Report contains details about your switch definition, the switch configurations for each switch, and port definitions.

If your IODF contains data for more than one switch, you can limit the report to the data for one switch and the configurations for that switch.

4.7.3 Operating System Report
The Operating System Report contains the configuration data that is used by the MVS/ESA operating system. If your IODF contains data for more than one operating system, you can limit the report to the data for one operating system.

The Operating System Report function can produce three principal types of reports:
- The Device Report contains data about devices and has two parts:
  - The Device Report contains summary data.
  - The Device Detail Report contains detailed data about the devices.
- The EDT Report contains data about all the EDTs of your configuration. This report is available only for MVS.
- The Console Report contains data about all NIP consoles for MVS and all the consoles for VM in your operating system configuration.

4.7.4 CTC Connection Report
The CTC Connection Report shows CTC connections in your configuration that are defined through an ESCON director. In the case of incorrect definitions, the reports contains a list of messages with diagnostic information.

If the IODF contains more than one processor or logical partition, you can limit the report to data for one processor or partition.

4.7.5 Printing Reports Using HCD Panels
To print a report from the HCD dialog:

1. Select Print or Compare Configuration data from the HCD Primary menu, and Print Configuration Reports from the next panel. See Figure 140.
2. Select the desired report. Depending on the amount of output expected, you may wish to limit the report.

3. Modify the JOB statement to meet your installation requirements.

4. Press Enter.

   For CSS and OS reports you are presented with another panel which allows further selections, see Figure 141.

5. If you have selected the option to limit the report output, then the panel shown in Figure 142 will be displayed. You may press F4 to obtain lists of available options.

   Select the limiting parameters for the report. Press Enter.
4.7.6 Printing Report for Supported Hardware in Batch

The HCD Batch utility allows you to create the same reports as described in 4.7.5, “Printing Reports Using HCD Panels” in batch. For more details about the PARM specification, please refer to MVS/ESA Hardware Configuration Definition: User’s Guide.

In addition, it is possible to print a report containing a list of hardware supported on your system. The example below can be used to produce the output.

Invoke the batch utility as follows:

```
//MACKINS JOB (999,POK),’SUSAN’,CLASS=A,MSGCLASS=X,MSGLEVEL=(1,1)
//*
//*Print List of Supported Processors,Control Units and Devices
//*
//STEP1 EXEC PGM=CBDMGHCP,PARM=’REPORT,X’
//HCDRPT DD SYSOUT=*,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=6650)
//HCDMLOG DD DSN=MACKINS.HCD.MSGLOG,DISP=SHR
/*
```

4.7.7 Sample HCD Reports

For samples of the configuration reports created by HCD, refer to MVS/ESA Hardware Configuration Definition: User’s Guide.

4.8 HCD Graphical Reports

It is possible with HCD to view and print graphical representations of your configuration. These may be stored in a data set for later printing, or viewed on a graphics capable terminal.

**Note:** Prerequisite software is required for these functions. Refer to MVS/ESA Hardware Configuration Definition: User’s Guide for details.

Five Graphical reports may be obtained:

- **LCU report** Shows the CHPIDs, control units and devices building one or more LCUs for a designated processor.
- **CU report** Takes a control unit as focal point and shows all attachments of the control unit via switches up to the processor. It shows also the devices attached to the control unit.
CHPID report Shows, for a given processor, all defined channel paths and what is attached to the CHPID (switches, CUs, and devices).

Switch report Takes a switch (ESCON director) as focal point and shows everything attached to the switch. Free ports of the switch are also shown. If the switch is connected to another switch, that switch is shown as well.

CF Connect Report Takes a coupling facility as focal point and shows all connections (CFS/CFR channel pairs) that exist between the coupling facility and the other processors defined in the IODF. If ‘Include partitions’ has been specified, the partitions are shown above each accessible CHPID.

4.8.1 Obtaining Graphical Reports

To obtain a report proceed as follows:

1. Select Create or View Graphical Configuration Report from the HCD Primary menu. The panel described in Figure 143 is displayed.

```
Create or View Graphical Configuration Report

CBRPUTG0

Select the type of report you want, and specify the values below.

IODF name . . . . . . : 'SYS1.IODF55'

Type of report . . . .
   1. LCU report
   2. CU report
   3. CHPID report
   4. Switch report
   5. CF connection report

Processor ID . . . . . . + (for an LCU or a CHPID report)
Partition name . . . . . . + (to limit an LCU or a CHPID report)

Output data set . . . . . "MACKINS.IODF55.REPORT"

Output . . . . . . . . 2
   1. Write to output data set
   2. View

Figure 143. Create or View Graphical Configuration Reports Panel
```

2. Select the report to be produced, and the destination of the output. When you press Enter, the “Define Report Layout” panel is produced (Figure 144).

Most of the options are self explanatory, but it is worth remarking that HCD will automatically build an index for the configuration report if Index is set to 1. This can be useful when trying to view all occurrences of a particular object within a large amount of output.

If you have selected the CU report, then you can limit the amount of output by specifying particular groups of devices for which you want the report produced.
3. If View has been selected, then the graphics are displayed onto the terminal.

If it has been requested that the output be saved in a data set for later printing, then the output is written to the specified data set. This should have been previously allocated with an LRECL of 200 for BOOKIE, DCF and GML formats, and with an LRECL of 400 for the GDF format.

### 4.8.2 Writing the Output to a Data Set

When the output is to be written to the specified data set name it is important to note that the format of the output is dependent on the specification of the GCR_FORMAT parameter in the HCD profile allocated to the DD name HCDPROF.

There are four acceptable values for GCR_FORMAT:

- **BOOKIE** For BookMaster. This is the default.
- **DCF** To create a data set for DCF containing script commands.
- **GML** To create a data set for DCF containing GML tags.
- **GDF** To create one or more members in GDF format for printing with GDDM.

### 4.8.3 Viewing Output on the Terminal

A graphics capable device is required if output is to be viewed directly.

It could be very helpful to view your completed configuration definition using the graphical report function. An incomplete definition or missing connection will show up clearly, and you can then use the *Jump* function. This allows you to place the cursor on any defined object, press F4 and have the relevant definition panel be displayed. Changes made to the configuration are displayed after you have entered the *Refresh* command on the graphic display.

Look at the sample output in Figure 145. You can see that the 3990 control unit 1140 is not connected to a higher level object.

To correct this error proceed as follows:
1. Move the cursor so that it rests on the object to which the controller is to be connected (9032 switch device 01).


3. Select the switch from the Switch List panel, and the Work with ports action from the context menu.

4. From the Port List, select the port to which you will connect the controller, and the Connect to control unit action from the context menu.

5. Specify control unit 1140 on the Connect to Control Unit panel.

6. Press F3 until you are returned to the graphical report panel. Enter the Refresh command.

7. The updated report appears in Figure 146.

Wherever possible, HCD will attempt to display the output on one page or panel. If there is too much data to permit this, the output will be divided into segments by HCD. Keys /SF590000 F10 and /SF580000 F11 allow you to move between segments. Scrolling keys are as normal, but it is possible to press /SF590000 F5 and /SF590000 F6 to zoom out and in of the view.

In larger configurations you will probably receive a high amount of graphical report segments. To display the segment with a specific object, use the Locate command. For example, if you want to display the segment containing control unit 1140, enter L CU 1140. The segment will be displayed and control unit 1140 will be highlighted.
4.8.4 GDDM Considerations

It is now possible to produce a GDDM supported ADMGDF data set which may be printed on a suitable printer using GDDM’s print services.

Typing the command `Save` on the command line will cause the view to be saved to the PDS data set allocated to the DDname ADMGDF with an LRECL of 400.

4.8.4.1 Using GDDM to Print the Graphical Report

The ADMGDF output file can be printed using GDDM. There are a number of ways of doing this:

- Invocation of the ADMUCDSO utility to convert the ADMGDF file to a format suitable for printing at your location
- Using the ADMCHART (PGF) utility to load the ADMGDF and route output to a printer predefined in the GDDM ADMDEFS DD

4.9 Comparing Configuration Data

This section describes comparisons that can be performed between two IODFs, and between hardware and software definitions.
4.9.1 Comparing IODFs

You can compare the contents of two IODFs from different perspectives and thus find the differences between the two IODFs. The following comparisons can be made:

CSS  Compares the IODFs from the channel subsystem perspective and shows all differences about the properties, including the relationships to other objects:
- Processors (including partitions, channel paths)
- Control units
- Devices

Switch  Compares all switches defined in the two IODFs and lists any differences in the switch properties and switch configurations.

Operating system  Compares the IODFs from the operating system perspective and shows all changes concerning:
- Device parameters or features
- EDTs and esoterics grouped in the EDTs

In this context, HCD introduces the notion of a new and old IODF. The new IODF is considered an updated version of the old IODF.

To compare two IODFs, proceed as follows:

1. Select Print and compare configuration data on the HCD primary menu and specify the name of the new IODF. This displays the panel shown in Figure 147.

2. Select Compare IODFs. This displays the panel shown in Figure 148, where you are asked for the name of the old IODF as well as other parameters controlling the compare process.
3. Select the view of the comparison to be done. Note that more than one view can be selected. HCD asks you then whether you want to limit the compare views to a certain pair of objects (processors, switches, or operating system).

If you do not want to limit the comparison, enter a 2 and press Enter. HCD then compares each processor in the new IODF against its equivalent in the old IODF, if, for example, the processor view were selected on the previous panel.

**Note:** To ensure that the report is of a manageable size, it is strongly recommended that the scope of the comparison be limited. See Figure 149.

4. If you choose to limit the compare, the panels shown in Figure 150 are displayed one after the other depending on the specified compare views.
Figure 150. Compare IODF Limitation Panels

5. The subsequent Select Print Options panel (shown in Figure 151) allows you to limit the scope of report printouts to inserted, deleted, or unchanged data, or to IDs of unchanged items.

Figure 151. IODF Compare - Select Print Options Panel

6. Pressing Enter submits the job that produces the compare report.

4.9.2 Comparing Hardware and Software Definitions

The compare function can be used to compare the definitions made for a particular processor or partition when running in LPAR mode against the definitions for a particular operating system. The function can be used to determine whether a device is defined for the CSS but not for the operating system or vice versa. It also reports any discrepancies in the device type definition.

To compare the hardware and software definitions for a system, proceed as follows:
1. Select **Print and compare configuration data** on the HCD primary menu. This displays the panel shown in Figure 152.

![Print and Compare Configuration Data Panel](image)

**Figure 152. Print and Compare Configuration Data**

2. Select **Compare CSS / operating system views**. This displays the panel shown in Figure 153. Specify the processor ID, the partition name, if applicable, and the operating system configuration ID. Specify also whether you want all devices listed or only those that differ (the latter is the default).

![Compare CSS / OS Views Panel](image)

**Figure 153. Compare CSS / OS Views Panel**

3. Pressing Enter submits the job that produces the compare report.

Examples of report output can be found in *MVS/ESA Hardware Configuration Definition: User’s Guide*. 
4.10 Activating a Switch Configuration

This section deals with the task of activating an ESCON Director port matrix that is defined in HCD.

The following topics are discussed:

- Prerequisites for activation
- Activation steps

4.10.1 Prerequisites for Activation

Before you can activate switch configurations on an active ESCON Director, you must have:

- The ESCON Manager installed and active. You need at least ESCON Manager Release 1.2.
- A switch device must be specified in the IODF for the ESCON Director that is to be updated.
- A production IODF for activating a switch configuration.

4.10.2 Activation Steps

In general, you can choose between two kinds of switch activation:

- Single Switch Activation
  Only one ESCON Director is activated at a time. Refer to activation step 1.
- Multiple Switch Activation
  More than one ESCON Director is activated simultaneously. Refer to activation steps 1 and 2.

Activation steps:

1. Having selected **Activate and Process Configuration Data** on the HCD Primary panel, you are presented with the Activate Configuration Data panel. See Figure 154.

![Activate Configuration Data Panel](image-url)
Select **Activate switch configuration**. The Activate Switch Configuration panel is displayed. See Figure 155.

![Activate Switch Configuration Panel](image)

You may now specify the switch ID and switch configuration ID that is to be written to the ESCON Director.

Specify whether you want an ESCM lock of another user to be broken. Since HCD issues an ESCM GETLOCK command, you must indicate how HCD should handle the situation when there is an existing ESCM lock. The activation is not carried out when another user has the ESCM lock and you have indicated a wish to preserve that lock. Issuing the ESCM GETLOCK command gives HCD complete ESCM processing control and the active processes of any other ESCM user are interrupted. For more details about the ESCM lock, refer to *Using the Enterprise Systems Connection Manager*.

Note that the switch ID for the switch configuration you want to activate must have a switch device defined in the IODF. HCD takes that correlating switch device number to identify the ESCON Director whose port matrix is changed by the switch activation. If you do not specify a switch device for the indicated switch, HCD rejects the switch activation. For more details on how to define a switch device, see 4.3.2.1, “Connecting a Switch Control Unit” on page 56 and 4.3.2.2, “Connecting a Switch Device to an Operating System” on page 56.

2. It is possible to activate more than one switch at a time. On the Activate Switch Configuration panel, specify the *Switch configuration ID* but leave *Switch ID* blank. The Switch Activation List panel as shown in Figure 156 will be displayed.

On that panel, every switch that has a configuration with the indicated switch configuration ID is shown. Select one or more switches to be activated.
3. Now the Confirm Switch Configuration panel shown in Figure 157 is displayed. Confirm the activation request.

When you press Enter, the following message is displayed on your screen.

```
Switch activation in progress - please wait.....
```

When the processing is complete, a confirmation message appears in the message list. The activation is now complete.

If the activation of one of the selected switches fails, the ESCON Manager backs out activation of all the other switches. Thus, the previously active port matrix is restored on every affected ESCON Director.

## 4.11 Examples of How-to-do with HCD

This section gives some useful hints and tips on how to work with the HCD dialog in an effective way. Some common user tasks and configuration scenarios are described step-by-step, showing each affected panel, and the necessary input. Use this section as a guide and instruction on managing your configuration tasks.
The following tasks are described:

- Change the "dynamic" parameter for a group of devices.
- Add devices to esoterics.
- Attach a group of devices to another control unit.
- Determine whether a device is defined as dynamic.
- Change the type of a group of devices and control units.
- See the device parameter and feature values for devices attached to a specific operating system in one panel.
- Define NIP consoles (MVS) or VM consoles.
- Change the identifier of an object.
- Change the configuration from basic to LPAR and from LPAR to basic.

### 4.11.1 Changing the Dynamic Parameter

This section describes how a device or a group of devices can be made dynamic (that is, that it can be added, deleted, or changed using the dynamic I/O reconfiguration function).

The *dynamic* parameter is part of the device/operating system relationship, thus it can be set or modified when adding or changing a device definition. Refer to Figure 56 on page 51 for an example of this panel.

The way to change the *dynamic* parameter is described below.

1. On the HCD primary menu, select **Define, Modify or View Configuration data**, then select **Operating System Configurations**. The panel shown in Figure 158 appears.

   ![Figure 158. Operating System Configuration List Panel](image)

   **Figure 158. Operating System Configuration List Panel**

2. Select a configuration ID, and the **Work with attached devices** action from the context menu, see Figure 159.
3. The panel shown in Figure 160 is displayed.

4. Choose action bar option **Filter** and select **Set Filter**.

5. On the Filter I/O Device List panel, (Figure 161) specify the type of the devices for which you want to change the dynamic parameter, for example, 3390, and specify N in the DYNAMIC column.
6. A filtered I/O device list is displayed showing all 3390s that have Dynamic=No defined.

7. Use [ ] and [ ] in the action column to mark the beginning and the end of the group of devices to be changed and press Enter. Select the **Attribute Group Change** action from the context menu. The panel shown in Figure 162 is displayed.

8. Select **Allow dynamic configuration**.

9. Pressing Enter re-displays the I/O Device List panel showing Y in the Dyn column for all changed devices (Figure 163).
4.11.2 Adding Devices to Esoterics

The task of adding devices to esoterics is part of connecting devices to an operating system definition.

There are two points at which devices may be added to an esoteric:

- When adding devices and connecting them to the operating system
- At any time by manipulating EDTs after the devices have been defined and connected to an operating system

4.11.2.1 When Adding New Devices

When creating a device or set of devices and defining the devices to an MVS operating system, HCD automatically displays the panel shown in Figure 164, showing a list of defined EDTs. You can then select one or more EDTs.

Figure 163. I/O Device List

Figure 164. Assign/Unassign Device to Esoteric Panel
Assign the device by overtyping the No in the Assign field with Yes. See Figure 165.

<table>
<thead>
<tr>
<th>CBDPDV16</th>
<th>Assign/Unassign Device to Esoteric</th>
<th>Row 1 of 7</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Specify Yes to assign or No to unassign. To view devices already assigned to esoteric, select and press Enter.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Configuration ID : OSPROD Production System</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Device number : 0200 Number of devices : 32</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Device type : 3390 Generic : 3390</td>
<td></td>
</tr>
<tr>
<td>/ EDT.Esoteric Assigned Starting Number Number of Devices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>_ 00.DASDA</td>
<td>YES</td>
<td>0200</td>
</tr>
<tr>
<td>_ 00.POOLA</td>
<td>No</td>
<td>____</td>
</tr>
<tr>
<td>_ 00.POOLB</td>
<td>No</td>
<td>____</td>
</tr>
<tr>
<td>_ 00.SYSDA</td>
<td>No</td>
<td>____</td>
</tr>
<tr>
<td>_ 00.SYSSQ</td>
<td>No</td>
<td>____</td>
</tr>
<tr>
<td>_ 00.TAPE</td>
<td>No</td>
<td>____</td>
</tr>
<tr>
<td>_ 00.VIO</td>
<td>No</td>
<td>____</td>
</tr>
<tr>
<td>************************************************** Bottom of data **************************************************</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 165. Assigning Devices to an Esoteric

If you do not want all devices to be assigned to the esoteric, specify the starting device number and range in the fields to the right of the designated device. Only the specified devices are then assigned to the esoteric.

4.11.2.2 Using EDT Maintenance
At any time you can add additional devices to an esoteric or define new esoterics. Proceed as follows:

1. Select an operating system configuration from the Operating System List panel and the Work with EDTs action from the context menu.
   This displays the EDT List panel. Select an EDT and the Work with esoterics action from the context menu.

2. Select an esoteric and the Assign devices action from the context menu.
   This displays the Assign/Unassign Devices to Esoteric panel shown in Figure 166.
Figure 166. Assign/Unassign Devices Panel

3. To assign a device to the esoteric, change the Assigned field to Yes. You may use the “Starting Number” and “Number of Devices” fields to limit the assignment to a subset of the devices specified in the “Devices” field.

You may also use this panel to unassign devices from the esoteric by reducing the device range to which the esoteric applies, or by changing the Assigned value to No.

4.11.3 Attaching Devices to Another Control Unit

This section describes the steps needed to move a group of devices from one control unit to another.

1. Select Control Units from the Define, Modify or View Configuration Data panel. Figure 167 is displayed.

Figure 167. Control Unit List Panel

2. Select a control unit from which devices are to be moved and the Work with attached devices action from the context menu.
3. Pressing Enter gives you a list of all devices attached to this control unit, shown in Figure 168.

<table>
<thead>
<tr>
<th>Control Unit Numbers +</th>
</tr>
</thead>
<tbody>
<tr>
<td>0100 0200 ____ ____ ____ ____ ____ ____</td>
</tr>
<tr>
<td>0101 0200 ____ ____ ____ ____ ____ ____</td>
</tr>
<tr>
<td>0102 0200 ____ ____ ____ ____ ____ ____</td>
</tr>
<tr>
<td>0103 0200 ____ ____ ____ ____ ____ ____</td>
</tr>
<tr>
<td>0104 0200 ____ ____ ____ ____ ____ ____</td>
</tr>
<tr>
<td>0105 0200 ____ ____ ____ ____ ____ ____</td>
</tr>
<tr>
<td>0106 0200 ____ ____ ____ ____ ____ ____</td>
</tr>
</tbody>
</table>

Figure 168. I/O Device List Panel

4. Select a device or range of devices from the I/O Device List panel and the CSS Group Change action from the context menu.

5. After pressing Enter, the panel in Figure 169 is displayed with a list of all control units the device group is attached to.

<table>
<thead>
<tr>
<th>Change Device Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify the control units the devices are attached to.</td>
</tr>
<tr>
<td>Connected to CUs . . 0100 0200 ____ ____ ____ ____ ____ +</td>
</tr>
</tbody>
</table>

Figure 169. Change Device Group Panel

6. Add or delete control unit numbers as appropriate. (Figure 170)

<table>
<thead>
<tr>
<th>Change Device Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify the control units the devices are attached to.</td>
</tr>
<tr>
<td>Connected to CUs . . 0100 0381 ____ ____ ____ ____ ____ +</td>
</tr>
</tbody>
</table>

Figure 170. Change Device Group Panel

7. Pressing Enter takes you to the panel shown in Figure 171.
8. If you do not want to change any other characteristics, press Enter again. This displays the panel shown in Figure 172, where both the old and new control unit numbers can be seen.

4.11.4 Determining Whether a Device Is Dynamic or Static

This section describes the steps to determine whether a device is defined as dynamic or static. For a definition of static and dynamic devices, refer to 8.2.1, “Types of Devices” on page 212. To make the determination, proceed as follows:

1. Select Operating System Configurations from Define, Modify or View Configuration Data panel.

2. Select an operating system and the Work with attached devices action from the context menu. This displays the list of all devices defined for the operating system. Figure 173 shows the panel displayed.
The *Dyn.* column indicates the dynamic attribute of the device, an indication of whether it is available for reconfiguration. Possible values are as follows:

- **Y**: Device is enabled for dynamic configuration changes.
- **N**: Device is disabled for dynamic configuration changes.
- **_**: Device is in an initial undefined state but is treated as static.

See 4.11.1, “Changing the Dynamic Parameter” on page 122 for instructions on how to set one or a group of devices dynamic or static.

### 4.11.5 Changing the Type/Model for a Group of Devices

This section describes how to change the device type or model (for example, from 3380 to 3390) for one or more devices. However, keep the following limitations in mind:

- All devices to be changed in one step must have the same device type and model.
- The control unit(s) that the devices are attached to must support the new device type.
- Required parameters must be identical.
- New device types must be supported by the same operating system type.

Proceed as follows:

1. Select a device from the I/O Device List panel.
2. Move the cursor to the action bar and select **Filter**. Set a filter such that only those devices of interest are displayed. Specify, for example, 3380.
3. Use `{` and `}` to mark the beginning and the end of a group of devices to be changed and select the **Device type group change** action from the context menu. This is shown in Figure 174.

---

<table>
<thead>
<tr>
<th>Device</th>
<th>Type</th>
<th>Dyn.</th>
<th>Loc</th>
<th>Control Unit Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>0140</td>
<td>3390</td>
<td>Y</td>
<td>1</td>
<td>1140 1141</td>
</tr>
<tr>
<td>0141</td>
<td>3390</td>
<td>Y</td>
<td>1</td>
<td>1140 1141</td>
</tr>
<tr>
<td>0142</td>
<td>3390</td>
<td>Y</td>
<td>1</td>
<td>1140 1141</td>
</tr>
<tr>
<td>0143</td>
<td>3390</td>
<td>Y</td>
<td>1</td>
<td>1140 1141</td>
</tr>
<tr>
<td>0144</td>
<td>3390</td>
<td>Y</td>
<td>1</td>
<td>1140 1141</td>
</tr>
<tr>
<td>0145</td>
<td>3390</td>
<td>Y</td>
<td>1</td>
<td>1140 1141</td>
</tr>
<tr>
<td>0146</td>
<td>3390</td>
<td>Y</td>
<td>1</td>
<td>1140 1141</td>
</tr>
<tr>
<td>0147</td>
<td>3390</td>
<td>Y</td>
<td>1</td>
<td>1140 1141</td>
</tr>
</tbody>
</table>

Figure 173. I/O Device List Panel
Figure 174. Actions on I/O Devices

This displays the panel, shown in Figure 175, on which you specify the new device type.

Figure 175. Device Type Group Change Panel

4. Pressing Enter re-displays the I/O Device List panel, but now the devices are of type 3390.

4.11.6 Show Parameter/Feature Values

HCD offers a function that lets you see the device parameter/feature list not only for a single device, but for all devices in an operating system configuration.

To view this list, proceed as follows:

1. Select Operating System Configurations from the Define, Modify or View Configuration data panel. The panel shown in Figure 176 appears.
2. Select an operating system and the **Work with attached devices** action from the context menu.

3. Pressing Enter gives you a list of all devices defined for the selected operating system, as shown in Figure 177.

4. Note the > indicator at the top right of the panel, which indicates that scrolling to the right provides additional information; press F20 to scroll to the right.

5. From the action bar select **Show/Hide**, and option 1 to show features. The Device Parameters / Features Profile panel is displayed, as shown in Figure 178, letting you specify the names of up to five parameters or features.
6. Enter the names of up to five parameters or features that you want to see. Press F4 to prompt for allowed parameters. Figure 179 shows an example.

```
<table>
<thead>
<tr>
<th>Device Parameters / Features Profile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify or revise the device parameters or features to be displayed in the I/O Device List for an operating system configuration.</td>
</tr>
<tr>
<td>Parameters/ features . . DYNAMIC SHARED</td>
</tr>
</tbody>
</table>
```

*Figure 179. Device Parameters/Features Profile Panel with Features Requested*

7. Pressing Enter again shows the rightmost part of the I/O Device List panel with the values for the previously selected parameters and features for all devices attached to the specified operating system. Figure 180 shows the panel.

```
<table>
<thead>
<tr>
<th>Goto Show/Hide Filter Backup Query Help</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBPDVFP I/O Device List Row 58 of 146 More: &lt;</td>
</tr>
<tr>
<td>Select one or more devices, then press Enter. To add, use F11.</td>
</tr>
<tr>
<td>Configuration ID . . : OSPROD Production System</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>/ Number Type DYNAMIC SHARED</td>
</tr>
<tr>
<td>_ 0138 3390 Yes No</td>
</tr>
<tr>
<td>_ 0139 3390 Yes No</td>
</tr>
<tr>
<td>_ 013A 3390 Yes No</td>
</tr>
<tr>
<td>_ 013B 3390 Yes No</td>
</tr>
<tr>
<td>_ 013C 3390 Yes No</td>
</tr>
<tr>
<td>_ 013D 3390 Yes No</td>
</tr>
<tr>
<td>_ 013E 3390 Yes No</td>
</tr>
<tr>
<td>_ 013F 3390 Yes No</td>
</tr>
<tr>
<td>_ 0140 3390 Yes Yes</td>
</tr>
<tr>
<td>_ 0141 3390 Yes Yes</td>
</tr>
</tbody>
</table>
```

*Figure 180. Operating System I/O Device List Panel with Values*

### 4.11.7 Defining NIP Consoles (MVS) or VM Consoles

This section describes the steps to define operating system consoles. The consoles can be NIP consoles for an MVS operating system or VM consoles for an VM operating system.

To define consoles, proceed as follows:

1. Define a console device and connect it to the operating system.

2. Select an Operating System Configuration and the *Work with consoles* action from the context menu. The panel shown in Figure 181 is displayed.
3. Press F11 to add a console definition. The panel shown in Figure 182 is displayed.

4. On the Add NIP Console panel enter the device number of the device you want to define as a NIP console and the order number of this console. Pressing Enter again displays the panel in Figure 183 on page 135, showing the console just defined.
Figure 183. NIP Console List Panel with Device Added

The order number determines the order in which the console will be selected at IPL. The console with the lowest order number is selected first. If that device is unavailable, then the device with the next lowest number will be selected. If you do not specify an order number, then HCD automatically assigns the console order number 1. It then increments the order numbers of previously defined consoles.

4.11.8 Changing the Identifier of an Object

The following sections describe what you have to do when you want to change the identifier or name of an object.

4.11.8.1 Changing the Processor ID

To change the processor ID, proceed as follows:

1. Select the processor you want to be changed from the Processor List panel and the Repeat action from the context menu.

2. After confirmation of the target IODF name, the Repeat Processor panel is displayed. The panel in Figure 184 shows properties of the selected processor. Specify the new identifier for the processor and press Enter.
HCD displays the Processor List panel now showing the just-created processor.

3. Select the old processor and the **Delete** action from the context menu to delete the old processor.

### 4.11.8.2 Changing the Partition Name

To change the partition name, proceed as follows:

1. Select the processor concerned from the processor list panel, and the **Work with partitions** action from the context menu. This displays all partitions defined for the selected processor.

2. Select the partition concerned and the **Change** action from the context menu. The panel shown in Figure 185 is displayed. You can now change any or all of these fields.
4.11.8.3 Changing the Channel Path ID

To change the channel path ID, proceed as follows:

1. Select the processor concerned from the Processor List panel, and the Work with attached channel paths action from the context menu. This displays a list of all defined channel paths for the selected processor.

2. Select the channel path concerned and the Change action from the context menu. This displays the Change Channel Path Definition panel shown in Figure 186.

3. Overtype the channel path ID with the new identifier and press Enter.

4.11.8.4 Changing the Operating System Configuration ID

To change the operating system configuration ID, proceed as follows:

1. Select the operating system from the Operating System Configuration panel, and the Repeat action from the context menu.

2. The target IODF name shown will be the same as the source IODF name. Press Enter to confirm the target IODF name. This displays the Repeat Operating System Configuration panel shown in Figure 187. The panel shows properties of the selected operating system. Specify the new identifier for the operating system and press Enter.
HCD displays the Operating System Configuration List panel now showing the just-created operating system.

3. Select the old operating system and the **Delete** action from the context menu to delete the old operating system.

### 4.11.8.5 Changing the EDT ID

To change the EDT ID, proceed as follows:

1. Select an operating system from the Operating System Configuration List panel, and the **Working with EDTs** action from the context menu. This displays the EDT list panel.

2. Select the EDT concerned and the **Repeat** action from the context menu. Confirm the target IODF name by pressing Enter. This displays the Repeat EDT panel shown in Figure 188. The panel shows properties of the selected EDT. Specify the new identifier for the EDT and press Enter.

   ![Figure 188. Add or Repeat EDT Panel](image)

3. Delete the old EDT.

### 4.11.8.6 Changing the Esoteric Name

To change the esoteric name, proceed as follows:

1. Select an operating system from the Operating System Configuration panel, and the **Working with EDTs** action from the context menu.

2. From the EDT List panel select an EDT, and the **Working with Esoterics** action from the context menu. This displays a panel showing all esoterics defined for the selected EDT.

3. Select the esoteric concerned and the **Change** action from the context menu. The next panel is shown in Figure 189.

   ![Figure 189. Change Esoteric Panel](image)

4. Overtype the esoteric name with the new identifier and press Enter.
4.11.8.7 Changing the Switch Configuration ID

To change the switch configuration ID, proceed as follows:

1. Select a switch from the Switch List panel, and the **Work with Switch Configuration** action from the context menu. This displays a panel showing all switch configurations defined.

2. Select the relevant switch configuration and the **Repeat** action from the context menu. This displays the Add or Repeat Switch Configuration panel shown in Figure 190. HCD has completed all fields except the **Switch configuration ID**. Provide this value, and overtype any fields you wish to change.

![Add or Repeat Switch Configuration Panel](image1)

HCD redisplays the Switch Configuration List panel now showing the just-created switch configuration.

3. Delete the old switch configuration.

4.11.8.8 Changing the Control Unit Number

To change control unit numbers proceed as follows:

1. Select a control unit from the Control Unit list panel, and the **Change** action from the context menu. This displays the panel shown in Figure 191.

![Change Control Unit Definition Panel](image2)
2. Change the control unit number on this panel.

3. Press Enter and you will see the Select Processor / Control Unit panel. Press Enter again and you will be returned to the Control Unit List panel, where you can see the change you have made.

4.11.8.9 Changing the Device Number
To change the device number, proceed as follows:
1. You need to first remove the connection to the control units for the devices to be changed, as follows:
   a. Select a device from the Device List panel and the **CSS group change** action from the context menu.
   b. On the Change Device Group panel, remove the control unit numbers and press Enter.
2. Reselect the device, and the **Add like** action from the context menu. This causes the Add Device panel to be displayed as shown in Figure 192.

3. Specify the new device number and the control units to which it will be connected. Press Enter.
4. HCD displays panels showing the settings of the previously defined device. Changes may be made if required.
5. Delete the old device number.

4.12 Changing the Configuration from Basic to LPAR
Many installations still run only one MVS image on their processor. Together with new hardware and new software support available, it might be of advantage to upgrade the processor to an LPAR configuration, running several MVS images on that processor, each one in a logical partition.

The following is a checklist to assist you in changing your environment. Not all of the described steps may apply to your specific environment. In that case continue with the next step.
4.12.1 Changes to the IODF Definitions

1. Start with the currently active production IODF as the one to be changed. When performing the first change action, HCD will ask you to define a new work IODF and will copy all definitions to the newly created work IODF.

2. If you want to change the name of the processor (processor ID) make a copy of the processor definition (repeat action) and delete the old processor definition. Note, that if the old processor definition contained CFS channel paths connected to other processors, they will be disconnected as a result of the repeat action and have to be reconnected in a later step.

3. If your processor definition does not include the latest support level (see the List supported hardware action), change the processor definition and select the appropriate support level. Do not change the operation mode of the processor now.

4. Add one partition (even though the processor is still defined in basic mode). Include the partition in the access list of the channel paths that should be accessed by the partition.

5. Change the processor mode to LPAR.

6. Change the channel path mode to SHR for those channel paths you intend to share between partitions, or to REC for those channel paths you intend to switch between partitions after POR.

7. Add any new channel path not yet defined.

8. Add the other partitions as planned and define for every channel path whether the partition should be included in the access list or in the candidate list.

9. If you want to change the access list and candidate list of a channel path you can do it by editing the partition matrix on the Channel Path List panel (use F20 to move the work area to the right). Don’t forget to press Enter after you have made all changes.

10. Select the subset of devices which should be accessed by specific partitions only. Add the partitions to the explicit device candidate list of the selected devices (CSS group change action on devices).

11. If your processor definition contains CFS channel paths (may be now defined as shared) connect them again to the CFR channel paths of the coupling facility.

12. If the processor to be changed is connected to another processor via a CTC connection, you have to change the CTC definition of the other processor. Refer to Chapter 5, “ESCON CTC Definitions” on page 145.

   • If the processor to be changed uses a shared channel path for the CTC connection, add a logical address to the existing SCTC control unit on the other processor that corresponds to the partition number of the first partition you have defined. Add a new SCTC control unit and SCTC devices for every additional partition you have defined, as well as the logical address that corresponds to the partition number of the respective partition. You may regard the SCTC control unit as representing the partition that is defined in the other processor.

   • If the processor to be changed uses a non-shared channel path for every partition, you may have to add additional channel paths. Add a new SCTC control unit and SCTC devices for every additional partition you have defined, and add the control unit to the corresponding channel path.
13. If the newly defined partitions should also communicate with all other partitions, add the required CTC connections. Refer to Chapter 5, “ESCON CTC Definitions” on page 145.

14. If you don’t want to use one operating system configuration to IPL all MVS systems running in the defined partitions, you may create copies of the existing configuration and tailor all copies as required. An operating system configuration may also contain devices that are not physically accessible. They will be set offline during IPL.

4.12.2 Other Changes and Considerations

1. After you have completed the definitions build the production IODF. Solve any problem, indicated by a message after the definitions have been validated.

2. Write the IOCDS to the support element of the affected processor.

3. If the affected processor is defined in the IEASYMxx member of SYS1.PARMLIB, be sure to add an entry that describes the processor for each LPAR name defined.

4. If you have only one processor or if you have not shared the IODF, used for IPL, it is now the time to consider sharing the IODF. For more information see Chapter 3, “IODF Considerations” on page 7.

5. Setup the processor for LPAR mode at the hardware console.

6. Perform POR with the new IOCDS.

7. IPL the MVS systems in the respective partitions.

8. If you plan to activate further configuration changes dynamically, see 8.6.3, “LPAR Considerations” on page 219.

4.13 Changing the Configuration from LPAR to Basic

Assume you may want to run a processor, configured with several partitions, alternatively in basic mode, but you have only an LPAR processor definition.

The following is a checklist to assist you in changing your environment. Not all of the described steps may apply to your specific environment. In that case continue with the next step.

4.13.1 Changes to the IODF Definitions

1. Start with the currently active production IODF as the one to be changed. When performing the first change action HCD will ask you to define a new work IODF and will copy all definitions to the newly created work IODF.

2. If you want to change the name of the processor (processor ID), make a copy of the processor definition (repeat action) and delete the old processor definition. Note, that if your definition contained CFS channel paths, connected to other processors, they are disconnected as a result of the repeat action and have to be reconnected in a later step.

3. All devices, connected to a processor running in basic mode must have unique device numbers. If your processor, configured in LPAR mode, contains duplicate device numbers, rename the device numbers to make them unique.
4. If your processor definition contains shared channel paths with more than one partition in the access list, update the access list and the candidate list by removing all but one partition indicated with A and all partitions indicated with C. You can do this by editing the partition matrix on the Channel Path List panel (use F20 to move the work area to the right). Don’t forget to press Enter after you have made all changes.

5. Change all currently shared channels to dedicated. Note that any explicit device candidate list will be deleted by HCD during this step.

6. Change the processor mode to basic.

7. You may delete the partition definitions if you want. If they are not deleted HCD will ignore them.

8. If your processor definition contains CFS channel paths (may be now defined as DED), reconnect them to the CFR channel paths of the coupling facility.

9. If the processor to be changed is connected to another processor via CTC connections, you have to change the CTC definitions of the other processor. Delete all but one SCTC control unit that correspond to the partitions in the processor definition to be changed, and remove the logical address from the remaining SCTC control unit. Refer to Chapter 5, “ESCON CTC Definitions” on page 145.

10. If you have tailored the operating system definitions to the set of devices accessible from the respective partitions, you now have to merge the devices in one operating system definition.

**4.13.2 Other Changes and Considerations**

1. After you have completed the definitions build the production IODF. Solve any problem indicated by a message while the definitions are validated.

2. Download the IOCDS to the support element of the affected processor.

3. If the affected processor is defined in the IEASYMxx member of SYS1.PARMLIB, be sure to add an entry that describes the processor without LPAR names defined.

4. Setup the processor for basic mode at the hardware console.

5. Perform POR with the new IOCDS.

6. IPL the MVS system.
Chapter 5. ESCON CTC Definitions

This chapter describes how to define ESCON CTC configurations using the HCD dialog. Most installations will want to use the HCD migrate function to convert their existing definitions into an HCD format. This is covered in Chapter 6, “Migration” on page 181. Even if you plan to use migration as your initial step, this chapter gives a useful insight into the HCD panel structure and flow.

The definition of CTC connections is presented as four scenarios:

- The first scenario shows a simple ESCON CTC between two LPARs, without EMIF and without backup.
- The second scenario shows an example of a more complex CTC definition task, with EMIF, but without backup.
- The third scenario includes ESCON directors and shows the definition of backup ESCON CTCs.
- The fourth scenario shows a complex of three processors. This scenario brings together concepts from the first three scenarios, and presents a SCTC addressing scheme that we recommend for general use. It has been developed for use in a MVS XCF signalling environment, and works for VTAM APPN host-to-host connectivity as well. It provides a SCTC addressing scheme that can be used by operating systems that support 4-digit device numbers (such as MVS/ESA Version 5 and VM/ESA).

These scenarios illustrate defining CTCs using the HCD main panel as the starting point for each definition.

IOCP statements are included with the examples to help the reader better understand the definitions presented.

5.1 Introduction to ESCON Channels and CTCs

An ESCON CNC channel is an ESCON channel that can communicate with any ESCON control unit. An ESCON CTC channel is an ESCON channel and “under the covers” control unit that can communicate with a CNC channel. The ESCON CTC implements CTC control units and devices within the channel and supports up to 120 two-sided CTC control units (one side on the CTC channel, the other side on the CNC channel), and 512 two-sided CTC devices. A maximum of 256 ESCON CTC devices can be configured on a CTC control unit.

Both the ESCON CNC channel and ESCON CTC channel use the same ESCON channel hardware, but different licensed internal code (LIC). The CTC channel acts as a control unit (not a channel) on the ESCON I/O interface to the connected CNC channels.

The following general rules apply to ESCON CTC connections:

- A CTC connection requires an ESCON CTC channel at one end of the connection and an ESCON CNC channel at the other end of the connection. A CTC connection supports bidirectional CTC communications. A CTC channel and a CNC channel in a CTC connection can be used to send information from one MVS image to another.
• The CTC channel can be connected to a CNC channel point-to-point or via ESCON directors. It can be connected to multiple CNC channels using dynamic connections via an ESCON director.

• A CTC channel cannot form a CTC connection with another CTC channel.

• A CNC channel cannot form a CTC connection with another CNC channel.

• The CTC channel is dedicated exclusively to CTC operations. It can be connected only to CNC channels, either point-to-point or switched point-to-point.

• The CNC channel in a CTC connection can be configured to access other CTC channels and other ESCON I/O control units attached to the same ESCON director.

The ESCON multiple image facility (EMIF) allows PR/SM logical partitions to share channel paths. If a processor complex has EMIF capability and is running in LPAR mode, its logical partitions can share channel paths to reduce the number of physical connections between processor complexes. Both CTC and CNC channels can be defined as shared channels. Note that channels in a processor complex without ESCON EMIF capability cannot be shared by PR/SM logical partitions. Unshared channels are dedicated to a single partition (but they can be reconfigurable).

We now present some rules governing ESCON CTC control unit definitions.

• When an unshared CTC channel is connected to an unshared CNC channel, only one CTC control unit can be configured for the CTC-CNC connection.

• When an unshared CTC channel is connected to a shared CNC channel, a CTC control unit can be configured between the partition owning the CTC channel and each partition sharing the CNC channel.

• When a shared CTC channel is connected to an unshared CNC channel, a CTC control unit can be configured between each partition sharing the CTC channel and the partition owning the CNC channel.

• When a shared CTC channel is connected to a shared CNC channel, a CTC control unit can be configured between each partition sharing the CTC channel and each partition sharing the CNC channel.

One CTC-CNC connection may be sufficient for applications requiring communication between two MVS images. For example two MVS VTAM address spaces can communicate using a single CTC-CNC connection. The same is true of MVS TCP/IP address spaces. MVS XCF signalling between MVS images requires a pair of CTC-CNC devices between MVS images. We will present definitions that will cater to all of these connectivity requirements.

5.2 Defining ESCON CTCs between LPARs

This section shows an example of a two-partition CTC configuration. A processor is defined with two partitions and one ESCON CTC connection between the partitions.
The IOCP statements to define this ESCON CTC configuration are:

1. Host PROD1
   
   CHPID PATH=28,TYPE=CTC,PART=(LP2)
   CHPID PATH=2F,TYPE=CNC,PART=(LP1)

2. This definition allows LP1 to communicate with LP2:
   
   CNTLUNIT CUNUMBR=6020,PATH=(2F),UNIT=SCTC,UNITADD=(00,8)
   IODEVICE ADDRESS=(6020,8),CUNUMBR=(6020),UNIT=SCTC,UNITADD=00

3. This definition allows LP2 to communicate with LP1:
   
   CNTLUNIT CUNUMBR=6010,PATH=(28),UNIT=SCTC,UNITADD=(00,8)
   IODEVICE ADDRESS=(6010,8),CUNUMBR=(6010),UNIT=SCTC,UNITADD=00

These definitions provide eight SCTC devices. The UNITADD field in the IODEVICE statement provides the linkage between the devices defined on CHPID 28 and those defined on CHPID 2F. That is, device number 6020 with UNITADD 00 on CHPID 2F is used by LP1 to communicate with device number 6010 with UNITADD 00 on CHPID 28 (used by LP2). So, 6010 is connected with 6020, 6011 is connected with 6021, and so on. LP1 uses the 602x device numbers to communicate with LP2. You should think of the 602x devices as being the destination in LP2. LP2 uses the 601x device numbers to communicate with LP1. You should think of the 601x devices as being the destination in LP1. Notice that the addresses on the two ends of each SCTC device do not match. This is intentional. Matching device numbers mean duplicate device numbers, and we try to avoid duplicate device numbers. The second and third digits of the device number tell you the assigned destination image (01 is to LP1, and 02 is to LP2). This will be developed further in the later scenarios.
This configuration is easy to define using HCD:

1. Define the CTC and CNC channel paths and connect them to the logical partitions.
2. Define the SCTC control units and connect them to the channel paths.
3. Define the SCTC devices and connect them to the control unit and the operating systems.

To create the definitions:

1. Select **Define, modify or view configuration data** from the HCD primary menu.
2. On the next panel select **Processors**.
3. Select the processor and the **Work with attached channel paths** action from the context menu (action code 6 or 5). See Figure 194.

![Figure 194. Work with Attached Channel Paths](image)

4. Press `F11` to add the new CTC and CNC channels paths. The panel in Figure 195 shows the definition of CTC CHPID 28.
5. You are now prompted to select the partition that has access to the channel path. In this example only one partition can be selected, as the channel is defined as dedicated (operation mode is DED). See Figure 196.

Repeat steps 4 and 5 for CHPID 2F (the CNC channel path). Partition LP1 accesses the CNC channel path.

6. For each channel path, define the SCTC control unit. Select a CHPID and the Work with attached control units action from the context menu (or action code $).

7. Press F11 to add the control unit. The panel in Figure 197 shows adding the SCTC control unit attached to CHPID 28.
8. Complete the unit address and range for the control unit. This may be done on the panel shown in Figure 198 by scrolling right (F20) and filling in the appropriate fields, or by selecting the processor ID and the Select (connect, change) action from the context menu (or action code 5).

9. The details can now be entered on the Add Control Unit panel shown in Figure 199. The required fields are the unit address (X'00' in this example) and the number of units (8 in this example). These values come from the CTLUNIT statement for CUNUMBR=6010.
10. Repeat steps 6 to 9 to define control unit 6020 attached to the CNC channel path.

11. Define the SCTC devices to the hardware and software configurations. Select Define, modify, or view configuration data from the HCD primary menu, and select Devices from the next panel.

12. From the I/O device list, press F11 to add devices and connect them to a control unit. The panel in Figure 200 shows adding eight SCTC devices starting with device number 6010 and connecting them to control unit 6010.

13. Pressing Enter displays the panel shown in Figure 201. This panel allows you to connect the devices to a processor, and to specify the unit addresses. We have specified unit address 00. Since this device is connected to a dedicated channel, there is no explicit device candidate list. The fields can be updated on this panel, or select the processor and press Enter to display the Define Device / Processor panel.
Figure 201. Device / Processor Definition Panel

14. Press Enter to display the Define Device to Operating System Configuration panel (see Figure 202). Select the operating systems to which the device should be connected. In this example, the devices are connected to OSLP2. Remember, the 601x devices are used by LP2. Action code S next to OSLP2 displays the Define Device Parameters / Features panel (see Figure 203). Pressing Enter completes the definitions.

Figure 202. Define SCTC Device to Operating System Configuration

Figure 203. Define Device Parameters / Features Panel for SCTC
15. Repeat steps 11 through 14 to define devices 6020 through 6027 connected to the CNC channel path.

### 5.3 Defining an ESCON CTC in an EMIF Environment

The configuration in Figure 204 shows a processor in LPAR mode with three partitions named LP1, LP2 and LP3. EMIF is used to share channels 29 and 2C among the three partitions. Each partition connects to the other two using this single CTC/CNC pair.

![Figure 204. Shared ESCON CTC Configuration](image)

Figure 205 shows the IOCP statements that correspond to this configuration. LP1 is in hardware partition number 1, LP2 is in hardware partition number 2, and LP3 is in hardware partition number 3. This is defined in the RESOURCE statement.

We now construct a numbering scheme for control units and devices. We begin by assigning an image ID to each MVS image. This image ID is from X'00' through X'FF'. In this example:

- Image ID 01 represents partition LP1.
- Image ID 02 represents partition LP2.
- Image ID 03 represents partition LP3.

The control unit numbers are of the form 6xx, where xx is the image ID, and y is a zero for a first control unit, and a one for a second control unit. Control unit 6010 (01 is the image ID) is used by all other images for communication with LP1. Control unit 6020 (02 is the image ID) is used by all other images for communication with LP2. Control units 6030 and 6031 (03 is the image ID) are used by other images for communication with LP3. LP1 has a single control unit.
(6010) on the CTC channel path. This will be connected to control units on the CNC channel path in LP2 and LP3. LP2 has a single control unit (6020) on the CNC channel path. This will be connected to control units on the CTC channel path in LP1 and LP3. LP3 (and additional LPARs if they existed) requires two control units: one on the CTC channel path (6030), and one on the CNC channel path (6031).

The IOCP statements for defining this shared ESCON CTC configuration are:

Host PROD1:

RESOURCE PART=((LP1,1),(LP2,2),(LP3,3))
CHPID PATH=29,TYPE=CTC,SHARED,PART=((LP1,LP2,LP3),(=))
CHPID PATH=2C,TYPE=CNC,SHARED,PART=((LP1,LP2,LP3),(=))

- The following definition allows all other partitions to communicate with LP1:

  CNTLUNIT CUNUMBR=6010,PATH=(29),UNIT=SCTC,CUADD=1,UNITADD=((00,8))
  IODEVICE ADDRESS=(6010,8),CUNUMBR=(6010),UNIT=SCTC,UNITADD=00,
  PART=(LP2,LP3)

- The following definition allows all other partitions to communicate with LP2:

  CNTLUNIT CUNUMBR=6020,PATH=(2C),UNIT=SCTC,CUADD=2,UNITADD=((00,8))
  IODEVICE ADDRESS=(6020,8),CUNUMBR=(6020),UNIT=SCTC,UNITADD=00,
  PART=(LP1,LP3)

- The following definitions allow all other partitions to communicate with LP3:

  CNTLUNIT CUNUMBR=6030,PATH=(2C),UNIT=SCTC,CUADD=3,UNITADD=((00,8))
  IODEVICE ADDRESS=(6030,8),CUNUMBR=(6030),UNIT=SCTC,UNITADD=00,
  PART=(LP1)

  CNTLUNIT CUNUMBR=6031,PATH=(29),UNIT=SCTC,CUADD=3,UNITADD=((00,8))
  IODEVICE ADDRESS=(6030,8),CUNUMBR=(6031),UNIT=SCTC,UNITADD=00,
  PART=(LP2)

Figure 205. Shared ESCON CTC IOCP Equivalent Statements

Figure 206 is a logical view of the ESCON CTC definitions. A CTC-CNC connection is required between all three partitions, and at least four control units are required. Partitions LP2 and LP3 communicate with LP1 using the CTC channel path (CHPID 29) and control unit 6010. The devices attached to control unit 6010 have LP2 and LP3 in the explicit device candidate list (PART=). This prevents LP1 from communicating with itself. The logical address (CUADD=1) defined for control unit 6010, corresponds to LP1’s partition number (in the RESOURCE statement). This defines LP1 as the destination LPAR.

Partitions LP1 and LP3 communicate with LP2 using the CNC channel path (CHPID 2C) and control unit 6020. The devices attached to control unit 6020 have LP1 and LP3 in the explicit device candidate list. The logical address (CUADD=2) defined for control unit 6020, corresponds to LP2’s partition number.

Communication with LP3 is slightly different. LP1 communicates with LP3 using the CNC channel path and control unit 6030. The devices attached to control unit 6030 have only LP1 in the explicit device candidate list. LP2 communicates with
LP3 using the CTC channel path and control unit 6031. Devices attached to control unit 6031 have only LP2 in the explicit device candidate list.

![Diagram of ESCON CTC Connectivity](image)

**Figure 206. Shared CTC Connection - Logical View**

In summary, one control unit with devices is required for each of the first two partitions; one attached to the CTC channel path and one attached to the CNC channel path. Each additional partition requires two control units with devices; one attached to the CTC channel path and the other attached to the CNC channel path.

We are now ready to define the ESCON CTC connectivity between the three partitions. The following will be defined using the HCD dialog:

1. CTC and CNC channel paths, with all three partitions in the access list
2. SCTC control units, attached to the channel paths
3. SCTC devices, connected to the control unit / processor and the operating systems

The definition process is as follows:

1. Define both the CTC and CNC channel paths to the configuration, on the Add Channel Path panel. Specify SHR as the operation mode (this panel is shown in Figure 195 on page 149).
2. On the Define Access List panel, select all logical partitions that are to use the CTC and CNC channel paths.
3. The control units to be defined are those shown in Figure 206. From the HCD primary menu, select Define, modify or view configuration data to get the selection menu, then choose Control units from the selection menu. Press F11 to add control units. The panels in Figure 207 through Figure 209 show adding the SCTC control unit 6010 attached to CHPID 29. This is the only control unit needed for any number of partitions to communicate with
partition LP1. Specify the control unit number as 6010, and the control unit type as SCTC.

---

**Figure 207. Define EMIF SCTC Control Unit**

4. Select the processor and the *Select (connect, change)* action from the context menu.

---

**Figure 208. Select Processor for EMIF SCTC Control Unit**

5. Specify the CHPID (29), the unit address (00), the number of units (8), and the logical address that corresponds to the partition number of the target partition (1).
Repeat steps 3 through 5 for control units 6020, 6030 and 6031.

6. Select control unit 6010 from the control unit list and the Work with attached devices action from the context menu to define the SCTC devices to both the hardware and software configurations.

7. From the I/O device list, press $F11$ to add devices. The panel in Figure 210 shows eight SCTC devices being added starting with device number 6010, and attached to control unit 6010.

If you enter a description or serial number, you are prompted for the same details for all devices being defined, as shown in Figure 211.
Figure 211. Update Serial Number and Description of Device

8. After you have completed the information for all devices, you are presented with the panel shown in Figure 212. This allows you to connect the devices to the processor and also to specify the unit address (UA). The starting unit address and number of units must be within the unit addresses specified in the Unit address field of the control unit definition.

Figure 212. EMIF Device / Processor Definition

Select the processor and press Enter to display the Define Device / Processor panel, shown in Figure 213.
Define Device / Processor

Specify or revise the following values.

Device number . . : 6010  Number of devices . . : 8
Device type . . : SCTC
Processor ID . . : PROD1  ES/9021–982

Unit address . . . . . . . . . . 00 + (Only necessary when different from the last 2 digits of device number)

Time-Out . . . . . . . . . . No (Yes or No)
STADET . . . . . . . . . . Yes (Yes or No)

Preferred CHPID . . . . . +
Explicit device candidate list . yes (Yes or No)

Figure 213. Define EMIF SCTC Device / Processor

9. Specify Yes in the explicit device candidate list field. You are presented with the Define Device Candidate List panel shown in Figure 214. Select partitions LP2 and LP3, as these partitions communicate with LP1 using control unit 6010. By not selecting LP1, you prevent the definition of a circular path from LP1 to itself.

Define Device Candidate List

Select one or more partitions to allow them to access the device, or ENTER to continue without selection.

Device number . . : 6010  Number of devices . . : 8
Device type . . : SCTC
Processor ID . . : PROD1  ES/9021–982

/ Partition Name Description Reachable
/ LP1 LPAR for Development Yes
/ LP2 LPAR for Production Yes
/ LP3 LPAR for Test Yes
******************************************************************************

Figure 214. Define Device Candidate List (EMIF)

10. Once the devices are connected to the processor, you can now define them to the operating systems. Pressing Enter displays the Define Device to Operating System Configuration panel (see Figure 215).
In this example, we connect the devices to the operating systems that run in LP2 and LP3. Select the operating systems OSLP2 and OSLP3, and press Enter. You are presented with the Define Device Parameters / Features panel (shown in Figure 216) for each operating system.

If the software that will use the devices requires an installation-static definition, set DYNAMIC to No. If the software that will use the devices cannot use UCBs defined above 16MB, set LOCANY to No.

11. Define the 602x and 603x devices for the remaining control units (6020, 6030, and 6031).

The final configurations as defined to HCD are shown in Figure 217 through Figure 221.

• Figure 217 shows the resulting control unit list.
Figure 217. Shared EMIF SCTC Control Unit List after Definition

- Figure 218 shows a portion of the resulting device list.

Figure 218. Shared EMIF SCTC I/O Device List after Definition

- Figure 219 shows the devices that are defined to the operating system OSLP1.
Select one or more devices, then select an action.

Configuration ID . . : OSLP1  MVS for Production

<table>
<thead>
<tr>
<th>Device</th>
<th>Loc</th>
<th>Control Unit Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>6020</td>
<td>Y Y</td>
<td>6020</td>
</tr>
<tr>
<td>6021</td>
<td>Y Y</td>
<td>6020</td>
</tr>
<tr>
<td>6022</td>
<td>Y Y</td>
<td>6020</td>
</tr>
<tr>
<td>6023</td>
<td>Y Y</td>
<td>6020</td>
</tr>
<tr>
<td>6024</td>
<td>Y Y</td>
<td>6020</td>
</tr>
<tr>
<td>6025</td>
<td>Y Y</td>
<td>6020</td>
</tr>
<tr>
<td>6026</td>
<td>Y Y</td>
<td>6020</td>
</tr>
<tr>
<td>6027</td>
<td>Y Y</td>
<td>6020</td>
</tr>
<tr>
<td>6030</td>
<td>Y Y</td>
<td>6030</td>
</tr>
<tr>
<td>6031</td>
<td>Y Y</td>
<td>6030</td>
</tr>
<tr>
<td>6032</td>
<td>Y Y</td>
<td>6030</td>
</tr>
<tr>
<td>6033</td>
<td>Y Y</td>
<td>6030</td>
</tr>
<tr>
<td>6034</td>
<td>Y Y</td>
<td>6030</td>
</tr>
<tr>
<td>6035</td>
<td>Y Y</td>
<td>6030</td>
</tr>
<tr>
<td>6036</td>
<td>Y Y</td>
<td>6030</td>
</tr>
<tr>
<td>6037</td>
<td>Y Y</td>
<td>6030</td>
</tr>
</tbody>
</table>

Figure 219. Shared EMIF SCTC I/O Device List for OSLP1

- Figure 220 shows only those devices that are defined to the operating system OSLP2.

Select one or more devices, then select an action.

Configuration ID . . : OSLP2  MVS for LP2

<table>
<thead>
<tr>
<th>Device</th>
<th>Loc</th>
<th>Control Unit Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>6010</td>
<td>Y Y</td>
<td>6010</td>
</tr>
<tr>
<td>6011</td>
<td>Y Y</td>
<td>6010</td>
</tr>
<tr>
<td>6012</td>
<td>Y Y</td>
<td>6010</td>
</tr>
<tr>
<td>6013</td>
<td>Y Y</td>
<td>6010</td>
</tr>
<tr>
<td>6014</td>
<td>Y Y</td>
<td>6010</td>
</tr>
<tr>
<td>6015</td>
<td>Y Y</td>
<td>6010</td>
</tr>
<tr>
<td>6016</td>
<td>Y Y</td>
<td>6010</td>
</tr>
<tr>
<td>6017</td>
<td>Y Y</td>
<td>6010</td>
</tr>
<tr>
<td>6030</td>
<td>Y Y</td>
<td>6031</td>
</tr>
<tr>
<td>6031</td>
<td>Y Y</td>
<td>6031</td>
</tr>
<tr>
<td>6032</td>
<td>Y Y</td>
<td>6031</td>
</tr>
<tr>
<td>6033</td>
<td>Y Y</td>
<td>6031</td>
</tr>
<tr>
<td>6034</td>
<td>Y Y</td>
<td>6031</td>
</tr>
<tr>
<td>6035</td>
<td>Y Y</td>
<td>6031</td>
</tr>
<tr>
<td>6036</td>
<td>Y Y</td>
<td>6031</td>
</tr>
<tr>
<td>6037</td>
<td>Y Y</td>
<td>6031</td>
</tr>
</tbody>
</table>

Figure 220. Shared SCTC I/O Device List for OSLP2

- Figure 221 shows only those devices that are defined to the operating system OSLP3.
5.4 Defining ESCON CTCs with Backup Paths

The configuration to be defined is shown in Figure 222.

- This is a two processor environment, a 9021-982 with three logical partitions and a 9672-R61 with two partitions. Both processors have shared channel paths defined.
- The CTC paths will go through an ESCON director (ESCD). The previous two examples used point-to-point connections.
- Two ESCON directors are used to eliminate the ESCON director as a single point of failure. For every partition there will be paths defined through both directors.
- If there were additional processors in the configuration, there would be another CTC/CNC channel path pair connected from each additional processor to each ESCON director (illustrated in the next scenario).
We will continue to use the control unit and device numbering methodology introduced in the previous section.

- LP1 has image ID 01 through ESCD 01, and image ID 81 through ESCD 02.
- LP2 has image ID 02 through ESCD 01, and image ID 82 through ESCD 02.
- LP3 has image ID 03 through ESCD 01, and image ID 83 through ESCD 02.
- LP9 has image ID 09 through ESCD 01, and image ID 89 through ESCD 02.
- LPA has image ID 0A through ESCD 01, and image ID 8A through ESCD 02.

Since there are connections through two ESCON directors, there will be two control units used to communicate with a given partition, one through each director. To communicate with LP1, all other partitions will use control units 6010 and 6810. To communicate with LP2, all other partitions will use control units 6020 and 6820 (and so on for the other partitions).

The IOCP statements in Figure 223 show the definitions for processor PROD1. The definitions for communication among PROD1 LPARs appear first, followed by the definitions for communication from PROD1 LPARs to PROD2 LPARs.

The IOCP statements in Figure 224 show the definitions for processor PROD2. The definitions for communication among PROD2 LPARs appear first, followed by the definitions for communication from PROD2 LPARs to PROD1 LPARs.

A brief summary of the IOCP statements used in this example will help clarify the definitions.

**Statement Function**

**RESOURCE** Defines the association between a LPAR name, and the hardware partition number

**CHPID** Defines the channel type (CTC or CNC), the LPARs that share the CHPID (SHARED,PART=), and the switch to which the channel path is connected
CNTLUNIT Defines the SCTC control unit (UNIT=) and number (CUNUMBR=), the channel path to which the control unit is connected (PATH=), the destination link address (LINK=), the destination LPAR number (CUADD=) and the unit addresses (UNITADD=).

IODEVICE Defines the SCTC devices (UNIT=), the associated control unit number (CUNUMBR=), the device numbers (ADDRESS=), the starting unit address (UNITADD=), and the device candidate list (PART=)

IOCP statements to define PROD1 configuration:

• PROD1:
  
  RESOURCE PART=((LP1,1),(LP2,2),(LP3,3))
  CHPID PATH=30,TYPE=CNC,SHARED,PART=((LP1,LP2,LP3),(=)),SWITCH=01
  CHPID PATH=34,TYPE=CTC,SHARED,PART=((LP1,LP2,LP3),(=)),SWITCH=01
  CHPID PATH=A0,TYPE=CNC,SHARED,PART=((LP1,LP2,LP3),(=)),SWITCH=02
  CHPID PATH=A4,TYPE=CTC,SHARED,PART=((LP1,LP2,LP3),(=)),SWITCH=02

PROD1 to PROD1 communication:

• PROD1 LPARs to LP1 using Switch 01:
  
  CNTLUNIT CUNUMBR=6010,PATH=(30),LINK=(D1),UNIT=SCTC, CUADD=1,UNITADD=((00,8))
  IODEVICE ADDRESS=(6010,8),CUNUMBR=(6010),UNIT=SCTC,UNITADD=00, PART=(LP2,LP3)

• PROD1 LPARs to LP2 using Switch 01:
  
  CNTLUNIT CUNUMBR=6020,PATH=(34),LINK=(C1),UNIT=SCTC, CUADD=2,UNITADD=((00,8))
  IODEVICE ADDRESS=(6020,8),CUNUMBR=(6020),UNIT=SCTC,UNITADD=00, PART=(LP1,LP3)

• PROD1 LPARS to LP3 using Switch 01:
  
  CNTLUNIT CUNUMBR=6030,PATH=(34),LINK=(C1),UNIT=SCTC, CUADD=3,UNITADD=((00,8))
  IODEVICE ADDRESS=(6030,8),CUNUMBR=(6030),UNIT=SCTC,UNITADD=00, PART=(LP1)
  CNTLUNIT CUNUMBR=6031,PATH=(30),LINK=(D1),UNIT=SCTC, CUADD=3,UNITADD=((00,8))
  IODEVICE ADDRESS=(6030,8),CUNUMBR=(6031),UNIT=SCTC,UNITADD=00, PART=(LP2)

• PROD1 LPARS to LP1 using Switch 02:
  
  CNTLUNIT CUNUMBR=6810,PATH=(A0),LINK=(F1),UNIT=SCTC, CUADD=1,UNITADD=((00,8))
  IODEVICE ADDRESS=(6810,8),CUNUMBR=(6810),UNIT=SCTC,UNITADD=00, PART=(LP2,LP3)

Figure 223 (Part 1 of 2). Shared ESCON CTC IOCP Statements for PROD1
• PROD1 LPARs to LP2 using Switch 02:
  
  CNTLUNIT CUNUMBR=6820,PATH=(A4),LINK=(E1),UNIT=SCTC, 
  CUADD=2,UNITADD=((00,8))
  IODEVICE ADDRESS=(6820,8),CUNUMBR=(6820),UNIT=SCTC,UNITADD=00, 
  PART=(LP1,LP3)

• PROD1 LPARs to LP3 using Switch 02:
  
  CNTLUNIT CUNUMBR=6830,PATH=(A4),LINK=(E1),UNIT=SCTC, 
  CUADD=3,UNITADD=((00,8))
  IODEVICE ADDRESS=(6830,8),CUNUMBR=(6830),UNIT=SCTC,UNITADD=00, 
  PART=(LP1)
  CNTLUNIT CUNUMBR=6831,PATH=(A0),LINK=(F1),UNIT=SCTC, 
  CUADD=3,UNITADD=((00,8))
  IODEVICE ADDRESS=(6830,8),CUNUMBR=(6831),UNIT=SCTC,UNITADD=00, 
  PART=(LP2)

PROD1 to PROD2 communication:
• PROD1 LPARs to LP9 using Switch 01:
  
  CNTLUNIT CUNUMBR=6090,PATH=(30),LINK=(C4),UNIT=SCTC, 
  CUADD=9,UNITADD=((00,8))
  IODEVICE ADDRESS=(6090,8),CUNUMBR=(6090),UNIT=SCTC,UNITADD=00

• PROD1 LPARs to LPA using Switch 01:
  
  CNTLUNIT CUNUMBR=60A0,PATH=30,LINK=(C4),UNIT=SCTC, 
  CUADD=A,UNITADD=((00,8))
  IODEVICE ADDRESS=(60A0,8),CUNUMBR=(60A0),UNIT=SCTC,UNITADD=00

• PROD1 LPARs to LP9 using Switch 02:
  
  CNTLUNIT CUNUMBR=6890,PATH=(A0),LINK=(E4),UNIT=SCTC, 
  CUADD=9,UNITADD=((00,8))
  IODEVICE ADDRESS=(6890,8),CUNUMBR=(6890),UNIT=SCTC,UNITADD=00

• PROD1 LPARs to LPA using Switch 02:
  
  CNTLUNIT CUNUMBR=68A0,PATH=A0,LINK=(E4),UNIT=SCTC, 
  CUADD=A,UNITADD=((00,8))
  IODEVICE ADDRESS=(68A0,8),CUNUMBR=(68A0),UNIT=SCTC,UNITADD=00

Figure 223 (Part 2 of 2). Shared ESCON CTC IOCP Statements for PROD1
The definition of this shared ESCON CTC configuration in PROD2 is:

- **PROD2:**

  **RESOURCE PART=((LP9,9),(LPA,A))**
  **CHPID PATH=20, TYPE=CTC, SHARED, PART=((LP9,LPA), (=)), SWITCH=01**
  **CHPID PATH=23, TYPE=CNC, SHARED, PART=((LP9,LPA), (=)), SWITCH=01**
  **CHPID PATH=26, TYPE=CTC, SHARED, PART=((LP9,LPA), (=)), SWITCH=02**
  **CHPID PATH=29, TYPE=CNC, SHARED, PART=((LP9,LPA), (=)), SWITCH=02**

**PROD2 to PROD2 communication:**

- **LP9 to LPA using Switch 01:**
  
  `CNTLUNIT CUNUMBR=60A0, PATH=(20), LINK=(D4), UNIT=SCTC, X
  CADD=A, UNITADD=((00,8))
  IODEVICE ADDRESS=(60A0,8), CUNUMBR=(60A0), UNIT=SCTC, UNITADD=00, X
  PART=(LP9)`

- **LPA to LP9 using Switch 01:**
  
  `CNTLUNIT CUNUMBR=6090, PATH=(23), LINK=(C4), UNIT=SCTC, X
  CADD=9, UNITADD=((00,8))
  IODEVICE ADDRESS=(6090,8), CUNUMBR=(6090), UNIT=SCTC, UNITADD=00, X
  PART=(LPA)`

- **LP9 to LPA using Switch 02:**
  
  `CNTLUNIT CUNUMBR=68A0, PATH=(26), LINK=(F4), UNIT=SCTC, X
  CADD=A, UNITADD=((00,8))
  IODEVICE ADDRESS=(68A0,8), CUNUMBR=(68A0), UNIT=SCTC, UNITADD=00, X
  PART=(LP9)`

- **LPA to LP9 using Switch 02:**
  
  `CNTLUNIT CUNUMBR=6890, PATH=(29), LINK=(E4), UNIT=SCTC, X
  CADD=9, UNITADD=((00,8))
  IODEVICE ADDRESS=(6890,8), CUNUMBR=(6890), UNIT=SCTC, UNITADD=00, X
  PART=(LPA)`

**PROD2 to PROD1 communication:**

- **PROD2 LPARs to LP1 using Switch 01:**
  
  `CNTLUNIT CUNUMBR=6010, PATH=(20), LINK=(C1), UNIT=SCTC, X
  CADD=1, UNITADD=((00,8))
  IODEVICE ADDRESS=(6010,8), CUNUMBR=(6010), UNIT=SCTC, UNITADD=00`

- **PROD2 LPARs to LP2 using Switch 01:**
  
  `CNTLUNIT CUNUMBR=6020, PATH=(23), LINK=(D1), UNIT=SCTC, X
  CADD=2, UNITADD=((00,8))
  IODEVICE ADDRESS=(6020,8), CUNUMBR=(6020), UNIT=SCTC, UNITADD=00`
• PROD2 LPARs to LP3 using Switch 01:
  CNTLUNIT CUNUMBR=6030,PATH=(23),LINK=(D1),UNIT=SCTC, X
  CUADD=3,UNITADD=((00,8))
  IODEVICE ADDRESS=(6030,8),CUNUMBR=(6030),UNIT=SCTC,UNITADD=00

• PROD2 LPARs to LP1 using Switch 02:
  CNTLUNIT CUNUMBR=6810,PATH=(26),LINK=(E1),UNIT=SCTC, X
  CUADD=1,UNITADD=((00,8))
  IODEVICE ADDRESS=(6810,8),CUNUMBR=(6810),UNIT=SCTC,UNITADD=00

• PROD2 LPARs to LP2 using Switch 02:
  CNTLUNIT CUNUMBR=6820,PATH=(29),LINK=(F1),UNIT=SCTC, X
  CUADD=2,UNITADD=((00,8))
  IODEVICE ADDRESS=(6820,8),CUNUMBR=(6820),UNIT=SCTC,UNITADD=00

• PROD2 LPARs to LP3 using Switch 02:
  CNTLUNIT CUNUMBR=6830,PATH=(29),LINK=(F1),UNIT=SCTC, X
  CUADD=3,UNITADD=((00,8))
  IODEVICE ADDRESS=(6830,8),CUNUMBR=(6830),UNIT=SCTC,UNITADD=00

We are ready to define:
• Two processor IDs, with their corresponding logical partitions
• CTC and CNC channels, and the logical partitions in the access list
• SCTC control units, and the connections to attached channels
• SCTC devices, and the connections to attached control units and operating systems

The definition process is as follows:
1. From the Primary Option Menu select Define, modify or view configuration data and Processors from the context menu. F11 presents the Add Processor panel (see Figure 225). The processor ID, type and model are defined, and the configuration mode is set to LPAR.

![Add Processor Panel](image-url)
2. Define the 9672-R61 processor (as above). Figure 226 shows the results of the definitions.

![Processor List Panel](image1.png)

3. Define the partitions in each of the processors. From the Processor List select a processor and the **Work with partitions** action from the context menu (or action code PF). Pressing F11 displays the Add Partition panel (see Figure 227). Here we define the partition name and number.

![Add Partition Panel](image2.png)

This step must be repeated two more times for PROD1 and two more times for PROD2 in order to define all five partitions.

4. Define the channel paths. Starting from the Processor List panel, select a processor and the **Work with channel paths** action from the context menu to get to the Channel Path List panel. Press F11 to display the Add Channel Path panel (see Figure 228). The values appropriate for CHPID 30 have been entered.
Figure 228. Add Channel Path Panel

Pressing Enter displays the channel path access list (see Figure 229). If all partitions are selected in the Access List, HCD will not display the Candidate List panel.

Figure 229. Define Access List Panel

Repeat this step for the remaining seven channel paths (34, A0 and A4 on PROD1, and 20, 23, 26 and 29 on PROD2).

5. Select a channel path ID from the channel path list and the Work with attached control units action from the context menu. Press F11 to display the Add Control Unit panel (shown in Figure 230). Enter the control unit number (6010) and the control unit type (SCTC) for CTC control units, and press Enter.
6. On the next panel (see Figure 231), fill in the logical address (CUADD), source CHPID number, and destination port for all processors. We have specified CUADD 1 as partition number 1 (LP1) is the destination, CHPID 30 link address D1 for PROD1, and CHPID 20 link address C1 for PROD2. Press Enter.

7. On the following panel (see Figure 232), fill in the starting unit address number, and unit range. We have specified unit address 00 with a range of 8 for both processors. Press Enter. The attached column (Att.) will now show "Yes" as seen in Figure 233.
These steps must be repeated for all remaining control units.

8. Select a control unit and work with attached devices from the context menu. An empty I/O device list will be displayed. Press F11 to add devices to the control unit. Figure 234 shows the Add Device panel with the CU number inserted by HCD (6010 in the Connected to CUs field). Specify the device number (6010), the number of devices (8) and the device type (SCTC). Press Enter.

Figure 234. Add Device Panel
9. The Device / Processor Definition panel is shown in Figure 235. For the CTC definitions, there are two important parameters. The unit address field must be set to /SF59000000 /SF580000 for this configuration. The explicit device candidate list is used when defining devices that are used for communication between partitions on the same processor (to prevent circular definitions). When defining devices on PROD1 for connection to LP1, we specify yes to define an explicit device candidate list. For communication between different processors, do not specify an explicit device candidate list.

![Figure 235. Device / Processor Definition Panel]

Press Enter to display the panel shown in Figure 236.

Select LP2 and LP3 for inclusion in the device candidate list.

![Figure 236. Device Candidate List Panel]

10. Press Enter to display the Define Device to Operating System Configuration panel (see Figure 237). For device addresses 6010-6017, select the operating systems running in LP2, LP3, LP9 and LPA (OSLP2, OSLP3, OSLP9 and OSLPA, respectively). We choose these operating systems as they are the ones that communicate with LP1, and 601x are the devices used to communicate with LP1. Select the operating systems (using /), and then 1 from the context menu Actions on selected operating systems. Press Enter.
11. Enter the appropriate values on the Define Device Parameters / Features panel (see Figure 238). Press Enter.

Repeat this step for the remaining operating systems.

12. The final I/O Device List panel shows all defined devices with the OS column set to Y. Press F3 to return to the control unit list, and select the next control unit for I/O definition.
5.5 Defining ESCON CTC Connections for the XCF Environment

In this section we further refine the control unit and device numbering scheme developed in the previous sections, and illustrate the use of this scheme in a MVS XCF signalling environment. The previous section presented all of the steps required to define SCTCs in an EMIF environment using ESCON directors. We won’t repeat going through the HCD panels in this section. We will use the same physical connectivity as in the previous section. That is, we will have one CTC/CNC pair of channel paths from each processor to each ESCON director, and we will use two directors.

XCF requires fully-connected systems in a sysplex. That is, every system must have a signalling path to every other system in the sysplex. These signalling paths can be SCTC devices or coupling facility list structures. In this section we define SCTC connectivity. In 4.5, “Defining a Coupling Facility Configuration” on page 84 we showed how to set up connectivity to a coupling facility.

Two SCTCs are required between every pair of MVS images in the sysplex. XCF treats a SCTC as a unidirectional resource. The two SCTCs form a read/write pair. In XCF terminology, this is known as PATHIN and PATHOUT. If system A is connected to system B, then the PATHIN SCTC for system A is the PATHOUT SCTC for system B, and the PATHOUT SCTC for system A is the PATHIN SCTC for system B. If there are N systems in the sysplex, there are N * (N-1) SCTCs required for full connectivity. If you want backup paths, then double the number of SCTCs. As there can be as many as 32 systems in a sysplex, you can see that we must have a good technique for defining and managing the SCTC control units and devices.

VTAM Version 4 Release 2 introduces a host-to-host connectivity that also uses read/write pairs of CTCs between VTAM APPN hosts. The numbering scheme that we develop in this section applies to VTAM and to XCF.

This scheme is also usable even if SCTC pairs are not required. We can use this scheme for VM RSCS, VM PVM and VTAM connections by using only one of the address pairs.

We now modify the SCTC numbering scheme developed in the previous sections.
• We continue to use 4-digit numbers for SCTC control units and devices.

• We assign a single image ID to every hardware image. You should assign an IMAGE ID to every LPAR or basic mode machine that will be connected using the SCTCs. If you have a processor that is in LPAR mode some of the time, and in basic mode some of the time, assign an image ID to each LPAR and an image ID to the basic mode configuration. An image ID is not assigned to coupling facility LPARs, as these LPARs have neither CTC nor CNC channel paths.

• We assign control unit numbers as follows:
  − Use 4xx0 for control units on a CTC channel path to ESCD 01.
  − Use 4xx8 for control units on a CTC channel path to ESCD 02.
  − Use 5xx0 for control units on a CNC channel path to ESCD 01.
  − Use 5xx8 for control units on a CNC channel path to ESCD 02.
In each of the control unit numbers above, ‘xx’ is the destination image ID.

• We will use the 4xxy control units as PATHIN, and the 5xxy control units as PATHOUT.

For each control unit we define four SCTC devices.
• SCTCs 4xx0 through 4xx3 are assigned to control unit 4xx0.
• SCTCs 4xx8 through 4xB are assigned to control unit 4xx8.
• SCTCs 5xx0 through 5xx3 are assigned to control unit 5xx0.
• SCTCs 5xx8 through 5xB are assigned to control unit 5xx8.

We use two of the four devices (so far). We use the low-order digit of the device number as an indicator of how the device is used. We use low-order digits 0 and 8 for XCF, and low-order digits 1 and 9 for VTAM. If we need BCTC devices, we define them similarly, on the existing control units.

• BCTCs 4xx4 through 4xx7 are assigned to control unit 4xx0.
• BCTCs 4xxC through 4xFF are assigned to control unit 4xx8.
• BCTCs 5xx4 through 5xx7 are assigned to control unit 5xx0.
• BCTCs 5xxC through 5xFF are assigned to control unit 5xx8.

An example will help clarify this numbering scheme. Assume system A is in image 02, and system B is in image 05.

• System A uses 4050 as PATHIN from system B, and system B uses 5020 as PATHOUT to system A (on ESCD 01).
• System A uses 5050 as PATHOUT to system B, and system B uses 4020 as PATHIN from system A (on ESCD 01).
• System A uses 4058 as PATHIN from system B, and system B uses 5028 as PATHOUT to system A (on ESCD 02).
• System A uses 5058 as PATHOUT to system B, and system B uses 4028 as PATHIN from system A (on ESCD 02).

VTAM will use address pairs 4051/5021, 5051/4021, 4059/5029, and 5059/4029, where PATHIN becomes a VTAM read address, and PATHOUT becomes a VTAM write address.
Now let’s move on to our last scenario. Figure 240 shows the configuration we will define.

**Figure 240. XCF Signalling Path Configuration**

Processors PROD1 and PROD2 are configured as they were in the previous section. Processor PROD3 is in basic mode. Notice the image IDs we have assigned (LP9 and LPA have changed from the previous section). PROD3 is assigned image ID 04. We will retain the same LPAR numbering as in the previous section. That is, LP1, LP2, and LP3 are in LPARs numbered 1, 2, and 3, respectively. LP9 and LPA are in LPARs numbered 9 and A, respectively.

In the previous scenarios, for paths to a given ESCON director, we defined one control unit for the first LPAR in a processor, one control unit for the second LPAR in a processor, and two control units for all other LPARs in a processor. This is the minimum number of control units required. It turns out that defining two control units for every LPAR to a given ESCON director takes only a little more time, and produces a configuration that is simpler to manage and understand.

The best way we have found to tabulate the information that must be defined to HCD is shown in Figure 241 through Figure 243. The information in the tables, along with the definition process shown in the previous section are all that is needed to complete the definitions for this configuration. One set of tables is required for each processor, as each processor uses different channel path identifiers for the CTC and CNC channels. If any processors use the same channel path identifiers, then only a single set of tables is required for those
processors. The only differences between the set of tables for one processor and the set of tables for another processor are the channel path identifiers. We chose different link addresses on ESCD 01 as compared with ESCD 02 so that it is obvious how a given path is constructed. Had we used the same link addresses on both ESCON directors, the Set 1 and Set 2 tables would have the same link addresses. (As an aside, these are more examples of the benefits of configuring processors symmetrically. There is only one SCTC configuration table. Once a single processor is configured, the HCD repeat function can be used to replicate the definitions for the additional processors.)

One final note about this configuration. We have previously discussed using the explicit device candidate list to prevent loops in the configuration for LPARs. This configuration has a machine in basic mode. We can prevent the loops in basic mode machines by using the ESCD port prohibit capability. We prohibit the C8-D8 connection in ESCD 01, and we prohibit the E8-F8 connection in ESCD 02.

Figure 241. SCTC Configuration for Processor PROD1
### Figure 242. SCTC Configuration for Processor PROD2

<table>
<thead>
<tr>
<th>Device</th>
<th>CTC</th>
<th>CU Path.</th>
<th>CU-UA Dev</th>
<th>Device</th>
<th>CNC</th>
<th>CU Path.</th>
<th>CU-UA Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4010</td>
<td>20.01</td>
<td>4010 20.C1.1</td>
<td>00,8 00</td>
<td>5010</td>
<td>23.01</td>
<td>5010 23.D1.1</td>
<td>00,8 00</td>
</tr>
<tr>
<td>4020</td>
<td>20.01</td>
<td>4020 20.C1.2</td>
<td>00,8 00</td>
<td>5020</td>
<td>23.01</td>
<td>5020 23.D1.2</td>
<td>00,8 00</td>
</tr>
<tr>
<td>4030</td>
<td>20.01</td>
<td>4030 20.C1.3</td>
<td>00,8 00</td>
<td>5030</td>
<td>23.01</td>
<td>5030 23.D1.3</td>
<td>00,8 00</td>
</tr>
<tr>
<td>4040</td>
<td>20.01</td>
<td>4040 20.D1.8</td>
<td>00,8 00</td>
<td>5040</td>
<td>23.01</td>
<td>5040 23.C8.</td>
<td>00,8 00</td>
</tr>
<tr>
<td>4050</td>
<td>20.01</td>
<td>4050 20.D4.9</td>
<td>00,8 00</td>
<td>5050</td>
<td>23.01</td>
<td>5050 23.C4.9</td>
<td>00,8 00</td>
</tr>
<tr>
<td>4060</td>
<td>20.01</td>
<td>4060 20.D4.A</td>
<td>00,8 00</td>
<td>5060</td>
<td>23.01</td>
<td>5060 23.C4.A</td>
<td>00,8 00</td>
</tr>
</tbody>
</table>

### Figure 243. SCTC Configuration for Processor PROD3

<table>
<thead>
<tr>
<th>Device</th>
<th>CTC</th>
<th>CU Path.</th>
<th>CU-UA Dev</th>
<th>Device</th>
<th>CNC</th>
<th>CU Path.</th>
<th>CU-UA Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4018</td>
<td>26.02</td>
<td>4018 26.E1.1</td>
<td>08,8 08</td>
<td>5018</td>
<td>29.02</td>
<td>5018 29.F1.1</td>
<td>08,8 08</td>
</tr>
<tr>
<td>4028</td>
<td>26.02</td>
<td>4028 26.E1.2</td>
<td>08,8 08</td>
<td>5028</td>
<td>29.02</td>
<td>5028 29.F1.2</td>
<td>08,8 08</td>
</tr>
<tr>
<td>4038</td>
<td>26.02</td>
<td>4038 26.E1.3</td>
<td>08,8 08</td>
<td>5038</td>
<td>29.02</td>
<td>5038 29.F1.3</td>
<td>08,8 08</td>
</tr>
<tr>
<td>4048</td>
<td>26.02</td>
<td>4048 26.F8.</td>
<td>08,8 08</td>
<td>5048</td>
<td>29.02</td>
<td>5048 29.E8.</td>
<td>08,8 08</td>
</tr>
<tr>
<td>4058</td>
<td>26.02</td>
<td>4058 26.F4.9</td>
<td>08,8 08</td>
<td>5058</td>
<td>29.02</td>
<td>5058 29.E4.9</td>
<td>08,8 08</td>
</tr>
<tr>
<td>4068</td>
<td>26.02</td>
<td>4068 26.F4.A</td>
<td>08,8 08</td>
<td>5068</td>
<td>29.02</td>
<td>5068 29.E4.A</td>
<td>08,8 08</td>
</tr>
</tbody>
</table>
Chapter 6. Migration

This chapter deals with the task of migrating existing configuration data sets such as IOCP, MVSCP and HCPRIIO into an IODF, along with migrating ESCON director switch configurations into an IODF. The emphasis is on working with IOCP and MVSCP input data sets.

The following topics are discussed:

- Introduction to migration in HCD
- Incremental update using IOCP
- Incremental update using MVSCP
- Migration statement enhancements

6.1 The Migration Function

For details about the migration function, refer to MVS/ESA Hardware Configuration Definition: User’s Guide.

This section is a brief introduction to migration in HCD. There are two reasons for providing the migration function in HCD. One is to allow you to use the current IOCP and MVSCP input data sets as the source for generating an IODF. This saves you having to define the hardware and operating systems in a new IODF. The second is to allow you to obtain the configuration information in an ESCON switch as input into an IODF. This saves you having to define the switch configuration in an IODF.

If you have the switch configuration in an IODF, then you can change the switch configuration using HCD. Once the IODF contains the new configuration, the activation function will send it to the switch. Of course, you require ESCON Manager (ESCM) to be running in your host in order for HCD to communicate with the switch, and the switch must be defined as a control unit and a device.

Within the migrate IOCP/MVSCP function, there are two options, the first being a complete migration. This means that the processor or operating system you are migrating into does not have a configuration defined in it. You can repeat this function as many times as necessary to define all the processors and operating systems you want to reside in the IODF. This option does not allow you to migrate another input data set to a processor or operating system that already has a configuration defined in it. See the HCD User’s Guide, (Preparing Your Input Data Sets for Migration) for the details and rules when using this option. The second option allows you to make changes to a processor or operating system which already has a configuration defined in it. This option is referred to as an “Incremental update,” or “Partial migration.” The rest of this chapter will use the name Incremental update. See Figure 244 for selecting this option. With this option you can change a part of a configuration using an input data set. Because of the numerous situations which can occur when using this option, it is important that you understand how it works. The following includes a description of the incremental process update and then some rules to follow when using it.
6.2 Understanding the Incremental Update

There are no IOCP or MVSCP statements whose purpose is to delete an object already defined in the IODF. It is possible though to have objects deleted if you do not pay attention to the rules listed below. If you always use a complete input data set when using this option, you will not experience any problem. If you use a partial data set for the processor or operating system that you are migrating into, then the following rules must be followed so that your results will be as expected. The first section will explain the process and rules when migrating an IOCP input data set. The second section will explain the process and rules when migrating a MVSCP input data set.

Note: When using the term rule, in most cases we mean suggested guidelines. But there are some that are mandated by HCD. There is no differentiation made when this is the case.

6.2.1 IOCP Incremental Update

Before we list the rules, let us try to understand the process. In order for the incremental update to occur, HCD must first determine if any objects referred to by statements in the input data set match up with any objects currently defined in the IODF. When a match does exist, this will indicate to HCD that you are trying to change something that already exists in the IODF. How HCD handles this change varies with each statement type. The following list provides an overview of how each type is handled.

A RESOURCE statement is handled as an add-on to the current IODF. If partitions are included in the statement which do not exist in the IODF for that processor, then they will be added. You will not lose any partitions that exist in the IODF, but which are not included in the RESOURCE statement.

A CHPID statement is handled as a replacement to the current IODF. If the CHPID is defined to the processor in the IODF, HCD will delete it from the processor. When a CHPID is deleted, a number of things happen. First, if the processor is running in LPAR mode, then the access and candidate list for the CHPID will be deleted. Second, all control units and their attached devices will be disconnected from the processor, through this path. (See Figure 245.) If this was the only connection to the control unit, the control unit will be deleted from the IODF. (See Figure 246.) If this was the only connection to the device, then the device will be deleted from the IODF. (See Figure 247.) By connection, we mean a defined connection to any processor in the IODF, and for a device connection, we also include a connection to an operating system in the IODF. If the CHPID was connected to a switch port, this information will be saved if the same switch is defined in the CHPID statement. It will be used when HCD adds the CHPID to the processor. HCD will then add the CHPID to the processor as defined in the CHPID statement.

Note: If you do not include all the control units and devices that were originally connected to the CHPID in the input data set, then they remain disconnected and/or deleted in the IODF.

If the result of the incremental update of a CHPID statement leaves a partition without access to any CHPID, (the partition is not included in any CHPID access or candidate list), then the partition will be deleted.
CBDPUT80 Migrate IOCP / MVSCP / HCPRIO Data

Specify or revise the following values.

- Processor ID . . . . . . . . . . . . ______ +
- OS configuration ID . . . . . . . . ______ +
- Combined IOCP/MVSCP input data set . _________________________________
  or
- IOCP only input data set . _________________________________
  or
- MVSCP only or HCPRIO input data set _________________________________
- Associated with processor ______ +
- partition ______ +
- Processing mode . . . . . . . . . . Z
  1. Validate
  2. Save
- Incremental update . . . . . . . . . 1
  1. Yes
  2. No
- MACLIB used . . . . . . . . . 'SYS1.MACLIB'
- Volume serial number . . . ______ + (if not cataloged)

**Figure 244. Migrate IOCP / MVSCP / HCPRIO Data Panel**

Current IODF

<table>
<thead>
<tr>
<th>Processor Input Data Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor P101</td>
</tr>
<tr>
<td>LP1</td>
</tr>
<tr>
<td>LP2</td>
</tr>
<tr>
<td>CHP-20</td>
</tr>
<tr>
<td>CHP-30</td>
</tr>
<tr>
<td>CU 100</td>
</tr>
<tr>
<td>DEV 100,32</td>
</tr>
<tr>
<td>O/S LP1</td>
</tr>
<tr>
<td>O/S LP2</td>
</tr>
</tbody>
</table>

IODP after Incremental Update

<table>
<thead>
<tr>
<th>Processor Input Data Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor P101</td>
</tr>
<tr>
<td>LP1</td>
</tr>
<tr>
<td>LP2</td>
</tr>
<tr>
<td>CHP-20</td>
</tr>
<tr>
<td>CHP-30</td>
</tr>
<tr>
<td>CU 100</td>
</tr>
<tr>
<td>DEV 100,32</td>
</tr>
<tr>
<td>O/S LP1</td>
</tr>
<tr>
<td>O/S LP2</td>
</tr>
<tr>
<td>Defined Connection</td>
</tr>
<tr>
<td>Defined Object</td>
</tr>
</tbody>
</table>

**Figure 245. CHPID Example 1**

CHPID 20 is currently reconfigurable, with LP1 in the access list and no candidate list. You want to add LP2 to the candidate list. Using the input data set shown and the incremental update option, the resulting IODF is shown. CU 100 and devices 100 - 11F are no longer connected to the processor through CHPID 20. Because a connection remains to the CU and the devices through CHPID 30, they are not deleted.
You want to perform the same update as in Figure 245 on page 183, but in this scenario, there is only one processor connection defined to CU 100 and devices 100 - 11F. CU 100 is deleted from the IODF because there are no connections to it. The devices 100 - 11F are not deleted, because they are still connected to the operating system.
Again you want to perform the same update as in Figure 245 on page 183, but in this scenario, there is only one processor to CU 100 and devices 100 - 11F, and the devices are not connected to an operating system. CU 100 is deleted as well as devices 100 - 11F.

A CNTLUNIT statement is handled as a replacement to the current IODF. Because of the match, HCD will first check to see if the control unit is connected to the processor. If it is, then HCD will disconnect the logical control unit (LCU) that the control unit specified in the CNTLUNIT statement is a part of. A logical control unit is the grouping of devices along with the control units that connect the devices to a single processor. See Figure 248 on page 186 for examples. If there are no other connections to an object within the LCU, then it will be deleted from the IODF, whether it be a control unit or a device. See Figure 249. HCD will then add the control unit (if not in the IODF) and connect it to the processor, as defined in the CNTLUNIT statement.

**Note:** If you do not include all the control units and devices (making up the LCU) which were originally connected to the processor in the input data set, then they remain disconnected and/or deleted in the IODF.
This figure gives four examples of different LCU configurations within an IODF. They are:

- CU 110,111 Devices 100 - 11F
- CU 120 Devices 200 - 21F
- CU 130,131 Devices 300 - 31F
- CU 140,141 Devices 300 - 31F
In the current IODF, CU 100 is connected to a switch (not shown). It is defined as being connected to port C0 on the switch and you need to change the definition to port D0. The LCU that CU 100 is part of will be deleted, because there are no other connections to either control unit or the devices. CU 100 is connected to the processor, but it will not have any attached devices.

An IODEVICE statement is handled as a replacement to the current IODF. HCD will verify that all control units specified in the IODEVICE statement are defined in the input data set (all objects that make up the LCU). If they are, then HCD will disconnect the LCU from the processor. See the CNTLUNIT statement for details. If they are not included, then HCD will return an error message. HCD will add the device (if no longer in the IODF) and connect it to the control units, as defined in the IODEVICE statement.

Lest it appear that one statement could disconnect or delete an object that was added by a previous statement, this is not the case. HCD performs a “preprocessing” on the input data set. It will examine all statements, making any necessary disconnections and deletions first. Then HCD will add all objects as defined in the input data set.

Note: At the completion of the migration function, there are no messages presented to indicate when disconnections and/or deletions occur in the IODF. With APAR OW12423, HCD issues a warning message if either a CHPID statement or a CNTLUNIT statement replaces an existing channel path or LCU.
6.2.1.1 Rules for Incremental Update Using IOCP

If you include an IODEVICE statement, you must also include all control units which are referenced in it. This is true, even if the control unit is already defined in the IODF.

If you include a CNTLUNIT statement, there are no requirements for any other statements, if this statement defines a new control unit. (If you are adding a control unit, you will probably want to define the devices, that will connect to it, so you will probably include the IODEVICE statement as well.) You must have all CHPIDs referenced in the control unit statement defined to the processor, either in the input data set, or in the IODF. If your statement changes a control unit which is already defined in the IODF, then an IODEVICE statement which defines the devices connected to it must be included as well. You cannot change the TYPE of a control unit if it is connected to more than the processor configuration to be changed, as you will get an error message indicating a TYPE conflict. If you want to change the TYPE of a control unit, then you will have to define a new control unit (new CU Number) along with the IODEVICE statement to define the new device type. Also keep in mind that if the control unit is connected to more than one processor, it will require a incremental migration to each processor. If you just include the CNTLUNIT and IODEVICE statements to add the new control unit and devices, you will not delete the old ones. If you want the old ones deleted, then you must include the CHPID statement, (see rule for including CHPID statement), or you may delete them using HCD.

If you include a CHPID statement in your input data set, you must also include all control units and devices which will use that CHPID, even if they already exist in the IODF. As a result, it is recommended not to include it when it is not necessary, to avoid possible unintended deletions. If you are migrating a complete input data set, then all your definitions will be there, and you will not have any problem. If you are working with a partial input data set, the only time it should be necessary to include any CHPID statements is for any of the following:

- Adding a CHPID
- Changing a CHPID (type, switch, partition)
- Changing a control unit type
- Changing a partition number

If you include a RESOURCE statement in your input data set, there are no requirements for any other statements. If you wish to change the partition number of an existing partition in the IODF, then you will also have to redefine all CHPIDs connected to that partition. This means that all the CHPIDs, control units, and devices must be included in the input data set. (See the rules for these statements.)

6.2.2 MVSCP Incremental Update

As with the IOCP incremental update, each statement within a MVSCP input data set will be handled differently by HCD. The following will provide an overview of each statement type, and then we will look at the rules.

An IOCONFIG statement has no significance to the migration of the input data set into the IODF, except as specified in the rules that follow (this is the same as with a complete migration).
An EDT statement is used to direct any included UNITNAME statements to the appropriate EDT. (Same as with a complete migration.)

An IODEVICE statement is handled as a replacement in the current IODF. As a result of a device match, HCD will determine if the device is connected to the operating system. If it is, then it will disconnect the device from the operating system. It will also remove it from both generic and esoteric lists for the operating system if it is included. If the device is a NIPCON device, then HCD will also delete the device from the NIPCON list. If this was the only connection to the device (no other connection to a processor or operating system), then HCD will delete the device. HCD will then add the device to the IODF (if not currently in the IODF), and connect it to the operating system, using the IODEVICE statement. It will also be added to the generic list for the device type.

**Note:** If you do not include the esoterics, devices and consoles that were originally connected to the operating system in the input data set, then they remain disconnected and/or deleted in the IODF.

A UNITNAME statement is handled as an add-on to the current IODF. Any esoterics which are already defined to the EDT will include what is currently in the IODF, and the devices specified in the UNITNAME statement. There is no disconnection or deleting of devices in the IODF as a result of this statement. (See Figure 250.)

A NIPCON statement is handled as a replacement in the current IODF. HCD will delete the current NIPCON list in the IODF for the operating system. It will then build a new list, based on the statement included in the MVSCP input data set. (See Figure 250.)

**Note:** At the completion of the migration function, there are no messages presented to indicate when disconnections and/or deletions occur in the IODF.
Notice that the new esoteric and EDT are added. The current esoterics are added-to. There is a new list for the NIP consoles. The devices 800 - 808 are connected to the operating system.

6.2.2.1 Rules for Incremental Update Using MVSCP

If an IODEVICE statement is included, be sure to include all UNITNAME and NIPCON statements which will define the device to the operating system completely.

If you include a NIPCON statement, you must include all devices that you want to be included in your NIPCON list.

If you include a UNITNAME statement, ensure that the appropriate EDT statement is included, to ensure the proper configuration.

If you do not include an EDT statement, and you have included a UNITNAME statement, HCD will use as the EDT ID, the value indicated in the IOCONFIG statement. If you do not include an IOCONFIG statement, then the EDT ID will default to a value of 00.

6.2.3 Summary

The procedures for performing these tasks are documented in the HCD User's Guide. Although it has not been mentioned previously, the same sequence rules apply for the incremental update as when performing a complete migration. Be aware that there is also the Map_CU Type keyword which can be included in an HCD profile to assist in the migration process as well. See the chapter How to
migrate Existing Input Data Sets in the MVS/ESA Hardware Configuration

6.3 Migration Statement Enhancements

As a result of performing a migration operation, there may be still some additional tasks required in HCD to complete the IODF so that it can be used. These tasks include defining parameters on certain control units and devices, defining switches if included in the configuration, as well as connecting CFS and CFR channels in a coupling facility environment. To save you from having to perform these tasks after a migration, there are some IOCP and MVSCP enhancements to allow these parameters, and so forth, to be included in IOCP and MVSCP input data sets.

6.3.1 Data Set Migration Enhancements

The migration function is extended to allow the specification of additional parameters in the input data set. Analogously, when building an IOCP input data set from the IODF, information is generated that describes the additional parameters of the configuration objects.

The additional information consists of:

- Processor description
- Processor serial number
- Processor SNA address
- Partition description
- Channel path description
- CF connection information
- Entry switch/port connected to a channel path
- Switch/port connected to a control unit
- CU serial number
- CU description
- Device serial number
- Device description
- Device user parameters
- Operating system description
- EDT description
- Switch information

When specifying switch information in the IOCP data set, the corresponding switch object (together with the referenced ports) have to be already defined in the IODF, or it has to be defined via the new SWITCH control statement.

Extension to the RESOURCE Statement: The RESOURCE statement is extended by the DESCL keyword, which allows you to specify descriptions for all the partitions defined.

\[
\text{DESCL=(‘desc1’,‘desc2’,…, each 32 chars)}
\]

Example:

\[
\begin{align*}
\text{RESOURCE PART} & = (\text{LP1,1),(LP2,2),(CF1,3)}, & * \\
\text{DESCL} & = (\text{‘Logical Partition 1’}, & * \\
& \text{‘System 3’}, & * \\
& \text{‘Coupling Facility’}) &
\end{align*}
\]
**Extension to the CHPID Statement:** The CHPID statement is extended by the:

- DESC parameter, which allows the specification of a description
- SWPORT parameter, which allows the specification of entry switch ports
- TPATH parameter, which allows the specification of a connected CF channel path

The TPATH parameter can be specified for a CF channel path (either CFR or CFS), which is the target channel path. When specified with a CFS channel path ID, it must contain the target CFR channel path. When specified with a CFS channel path ID, it must contain the target processor, target CFR channel path ID, and the CFS control unit and device numbers that are used for the CF connection. A CF connection uses two device numbers. Only one device number can be specified; the second one is the next device number (specified device number + 1). If the target CFR channel path is already connected to another CFS channel path, the existing connection of the CFR channel path is broken and a new connection is established using the CFS channel path.

When specified with a CFR channel path, it is checked whether the target channel path (which must be a CFS channel path) is already connected to the CFR channel path. If yes, the connection is preserved. If the target CFS channel path is not connected, or connected to another CFR channel path, a warning message is issued.

 DESC='description' 32 chars
 SWPORT=((swid1,port1),(swid2,port2),...) list of up to 8 sublists
                 (switch ID,port ID)
 TPATH=(proc,chpid,<,CFS CU,CFS device>) target processor and CHPID
                 for a CF connection
                 (for a CFS channel path,
                  also the CFS control unit
                  and CFS device)

Example:

CHPID PATH=(35),SWITCH=03,TYPE=CNC, *
  SWPORT=((03,FB)), *
  DESC='Chpid connected to switch'
CHPID PATH=(10),TYPE=CFS,PART=LP4, *
  TPATH=(PROC1,11,FFFE,FFF0) connected to CFR channel 11
  of processor PROC1 using CU
  FFFE and devices FFF0/1

**Extension to the CNTLUNIT Statement:** The CNTLUNIT statement is extended by the:

- DESC parameter, which allows the specification of a description
- SWPORT parameter, which allows the specification of connected switch ports
- SERIAL parameter, which allows the specification of a serial number

 DESC='description' 32 chars
 SERIAL=serial_number 10 chars
 SWPORT=((swid1,port1),(swid2,port2),...) list of up to 8 sublists
                 (switch ID,port ID)

Example:
CNTLUNIT CUNUMBR=9032,PATH=(35),UNITADD=((00,256)),LINK=(FE), *
UNIT=9032,SWPORT=((03,FE)), *
SERIAL=0123456789,DESC=’Switch description’

Extension to the IODEVICE Statement: The IODEVICE statement is extended by the:

- DESC parameter, which allows the specification of a description
- SERIAL parameter, which allows the specification of a serial number
- USERPRM parameter, which allows the specification of OS parameters private to a UIM. For parameters that are private to a UIM, see the supported MVS devices of the list supported hardware report.

Example:
```
IODEVICE ADDRESS=0111,UNIT=3490,CUNUMBR=777,USERPRM=((LIBRARY,YES))
IODEVICE ADDRESS=0112,UNIT=NCP,CUNUMBR=777,ADAPTER=TYPE1, *
USERPRM=((PUTYPE,2),(TIMEOUT,840),(DELAY,4),(TPSFEAT,NONE)),DESC=’First user parm added via Migr’, *
SERIAL=4711
```

Extension to the EDT Statement: The EDT statement is extended by the:

- DESC parameter, which allows the specification of a description

Example:
```
EDT ID=00,DESC=’Eligible Device Table 1’
```

New SWITCH Statement: A new SWITCH control statement is accepted, which allows you to define a SWITCH to the IODF. It allows you to specify:

- SWID parameter, which defines the switch ID (mandatory)
- UNIT parameter, which defines the switch unit (mandatory)
- MODEL parameter, which defines the switch model (optional)
- DESC parameter, which allows the specification of a description (optional)
- SERIAL parameter, which allows the specification of a serial number (optional)
- PORT parameter, which defines the installed ports (optional)

The specified ports must be supported by the switch type. At least the minimum installed port range is set to installed. If the switch already exists with an installed port range that differs the specified installed port ranges, only the new specified ports are set to installed if possible. That means, any existing installed port that does not hold a connection to a channel path or control unit is set to not installed if not specified with the PORT parameter. If a port that is not specified already holds a connection to another channel
path or control unit, a warning message is issued and the connection is preserved. The port remains defined as installed.

- **SWPORT parameter**, which allows you to specify the chained switch connections (optional)

  If the switch already exists, all existing connections to other switches are broken. The connections to other switches are established as specified by the SWPORT parameter.

The corresponding switch control unit and device have to be specified by corresponding CNTLUNIT and IODEVICE statements.

```
SWID=id 2 hex chars
UNIT=switch_unit like CU type
MODEL=switch_model like CU model
DESC='description' 32 chars
SERIAL=serial_no 10 char
PORT=((low_port_id,hig_port_id),...) up to 8 port ranges
SWPORT=((port_id,(swid,port_id)),...) up to 8 switch-switch connections
```

Example:

```
SWITCH SWID=02,UNIT=9032,MODEL=3, *
  PORT=((80,FB)), *
  DESC='9032-3 switch, installed 10/09/94', *
  SWPORT=(C0,(01,D1)) chained to switch 01 port D1 * via port C0
```

### 6.3.2 Enhancements to the IOCP Data Set Generation

When generating an IOCP input data set from an IODF that is not used for stand-alone IOCP and a profile option is set, HCD will generate the additional keywords if the information is available. In order to allow the data set to be processed by IOCP, the new parameters contain a special HCD tag in front of the data set record, which is interpreted by IOCP as a comment (and therefore ignored).

When re-migrating the data set into the IODF, HCD recognizes the HCD tags and processes the additional information. This processing is only done if the corresponding HCD profile option is active.

The following rules must be followed for each record so that the additional information is migrated into the IODF:

- The IOCP or MVSCP control statement does not have any comment.
- The additional HCD tagged records follow immediately the last record of the corresponding IOCP or MVSCP control statement.
- The HCD tag for additional keywords consists of the string `$HCDC$` starting in column 1.
- The first keyword starts at column 16.
- The last operand is not followed by a comma.
- There is no comment to the right of the operand.

Additionally, whole control statements can be tagged with the string `$HCD$` starting in column 1. This will cause the statement to be ignored by IOCP, but HCD will migrate this statement.
Example of a generated IOCP data set:

```
ID MSG1='FRED'S IOCPS
   MSG2='BBEI.IODF52.R52.PROD - 94-08-26 13:30', *
   SCR=P4 /* im * 94-08-2613:30:24BBEI*
   IODF52
   CHPID PATH=(31),TYPE=CNC
   CHPID PATH=(32),TYPE=CNC
   CHPID PATH=(33),TYPE=CNC
   CHPID PATH=(34),TYPE=CNC
   CHPID PATH=(35),SWITCH=03,TYPE=CNC
   /*$HCDC$ SWPORT=((03,FB))
   /*$HCDC$ DESC='Chpid connected to switch'
   CNTLUNIT CUNUMBR=0031,PATH=(31),UNITADD=((00,016)),UNIT=3490
   CNTLUNIT CUNUMBR=0032,PATH=(32),UNITADD=((10,016)),UNIT=3490
   CNTLUNIT CUNUMBR=0033,PATH=(33),UNITADD=((20,016)),UNIT=3490
   CNTLUNIT CUNUMBR=0034,PATH=(34),UNITADD=((30,016)),UNIT=3490
   CNTLUNIT CUNUMBR=9032,PATH=(35),UNITADD=((00,256)),LINK=(FE), *
       UNIT=9032
   /*$HCDC$ SWPORT=((03,FE))
   /*$HCDC$ SERIAL=0123456789
   /*$HCDC$ DESC='Switch description'
   IODEVICE ADDRESS=(031,002),UNITADD=00,CUNUMBR=(0031),STADET=Y,*
       UNIT=3490
   IODEVICE ADDRESS=(033,002),UNITADD=10,CUNUMBR=(0032),STADET=Y,*
       UNIT=3490
   /*$HCDC$ SERIAL=1111111111
   IODEVICE ADDRESS=(035,002),UNITADD=20,CUNUMBR=(0033),STADET=Y,*
       UNIT=3490
   /*$HCDC$ DESC='Second device's description'
   /*$HCD$ SWITCH ID=03,TYPE=9032,DESC='Sample Switch'.PORT=((C0,FB))
```

### 6.3.2.1 Controlling the Extended Support

The extended migration support, with HCD tags, is available only if the HCD profile contains the following entry:

```
MIGRATE_EXTENDED = YES
```

Specifying `MIGRATE_EXTENDED = NO` will avoid generating the additional keywords during IOCP data set build if the extended migration function is not used. Also, the migration function would ignore the commented `'*$HCDC'` and `'*$HCD$'` tags.
Chapter 7. MVS/ESA IPL Procedure

This chapter is intended to help the system programmer understand the requirements necessary to IPL an MVS/ESA system in a Dynamic I/O configuration environment.

Covered in this chapter are:

- Explanation of the LOAD parameter
- IPL messages
- LOADxx search order
- LOADxx member
- IODF processing at IPL
  - IODF selection
  - CONFIG ID selection
- SQA requirements
- Common IPL error situations
- Determining whether the hardware and software are in sync

The MVS system software is loaded by specifying the system residence volume device number and the load parameter value on the OPRCTL or SYSCTL frames of the ES/9000 processor, or on the Customize Load Profile panel on the 967x Hardware Management Console. The system residence volume device number should be specified in the L1 field (Unit Address) of the OPRCTL frame or in the A1 field (Load Unit Addr) of the SYSCTL frame. The load parameter (loadparm) is specified in the L2 field (Parm) of the OPRCTL frame or in the A2 field (Load Parm (A/N)) of the SYSCTL frame. Figure 251 and Figure 252 are examples of the ES/9000 OPRCTL and SYSCTL frames. The ES/9000 processor is operating in LPAR mode.

---

![Figure 251. ES/9000 OPRCTL Frame (Processor in LPAR Mode)](image)
SCP MANUAL CONTROL (ESA/390 MODE) (SYSCTL)

A= INITIALIZE SYSTEM CONTROL PROGRAM T= TARGET CP
- 1. Load Unit Addr : 048E 0. CP0 x3. CP3
-> 2. Load Parm(A/N) : 02C6LoA1 1. CP1 x4. CP4
  3. Initiate SCP Initialization x2. CP2 x5. CP5

B= INITIALIZE STANDALONE DUMP R= Not used
Auto Store Status = On
- 1. Load Unit Addr : 048C
  2. Initiate Standalone Dump
    (STOP CP FOR VALID DUMP)

C= RESTART
  1. Initiate Restart

D= Not used

COMMAND =>
BLS/OPT2 MVSL 0 .W 1 .W L. P. PSW0 Operating

Figure 252. ES/9000 SYSCTL Frame (Processor in LPAR Mode)

On the HMC, the Load Parameter should be updated on the Load parameter field in the load profile. See Figure 253.

Figure 253. Customize Load Profile Panel
7.1 Load Parameter

The load parameter is an 8-character field specified on either the OPRCTL or SYSCTL frame of the ES/9000 processor. It is specified in the L2 field of the OPRCTL frame or the A2 field of the SYSCTL frame.

The format of the Load parameter is:

<table>
<thead>
<tr>
<th>IODF DASD</th>
<th>LOADxx</th>
<th>IMSI</th>
<th>NUCx</th>
</tr>
</thead>
</table>

IODF LOADxx Prompt Nucleus
Device Suffix Character Suffix Number

The IODF DASD device number has four digits. You must specify a leading zero. If you do not specify a device number, MVS uses the IPL device to search for the LOADxx member and the IODF data set. If you do not specify a device number, but want to specify some of the other fields in the Load parameter, you must pad the IODF device number field (the first four positions) with periods (.), because the hardware left-justifies each character in the load parameter.

If you IPL an MVS system as a guest under VM, the following syntax should be used:

```
#CP IPL xxxx LOADPARM ddddxxsn
```

where:

- xxxx MVS SYSRES device number (same as L1 on OPRCTL frame)
- LOADPARM Equal to the L2 field of the OPRCTL frame
- dddd Device number of the IODF volume
- xx Suffix value of the LOADxx member
- s Initialization Message Suppression indicator (IMSI)
- n Alternate nucleus number (IEANUC0n)

For a further description of the LOADPARM, please refer to MVS/ESA SP V5 System Commands.

7.2 IPL/NIP Load Initialization Messages

Figure 254 shows the MVS initialization messages issued at IPL time. The messages indicate:

- Where the LOADxx member was found (SYSn.IPLPARM or SYS1.PARMLIB)
- Device number on which the LOADxx member data set was found
- Which LOADxx member was used
- IODF data set name
- Operating System Configuration identifier
- IODF device number
### 7.3 LOADxx Member Search Order

During the IPL phase of system initialization, MVS searches for an IPL parameter data set and the LOADxx member. The LOADxx member can reside either in a data set named SYSn.IPLPARM (where n is a character 0-9), which has the same PDS attributes as SYS1.PARMLIB, or in a SYS1.PARMLIB data set.

MVS first searches for a SYSn.IPLPARM data set on the IODF device as specified in the Load parameter of the OPRTCL / SYSCTL frame. The search is done for SYS0.IPLPARM through SYS9.IPLPARM, in that order. If a SYSn.IPLPARM data set is not found on the IODF device, MVS then determines whether a SYS1.PARMLIB data set is on the IODF device. If a SYS1.PARMLIB data set is not found on the IODF device, MVS searches for a SYS1.PARMLIB data set on the IPL device. If MVS does not find the SYS1.PARMLIB on the IPL device, a coded non-restartable wait state is loaded (WAIT code X'0B1'). Figure 255 illustrates the search order.

![Figure 255. LOADxx Search Order](image)

MVS/ESA follows the search order until it locates either a SYSn.IPLPARM data set or a SYS1.PARMLIB data set on the IODF device (IODF volume), or a SYS1.PARMLIB data set on the IPL device (SYSRES volume). Once an IPL parameter data set is located, MVS checks to see whether the specified LOADxx member is in that data set. If LOADxx is not in the first data set located, MVS enters a disabled WAIT 088. MVS does not continue searching to determine
whether the LOADxx member is present in any other SYSn.IPLPARM or
SYS1.PARMLIB data set.

7.4 LOADxx Member

The LOADxx member contents determine the selection of data sets used by the
system for the system initialization process.

7.4.1 Contents of LOADxx

The LOADxx member may contain the following statement types:

- IODF or MVSCP
- NUCLEUS
- SYSCAT
- SYSPARM

The IODF statement identifies the I/O definition file that contains information
about the I/O configuration defined to your system through HCD. The presence
of this statement causes the system to be initialized using an IODF data set
rather than an MVSCP-defined configuration ID.

For more details, please refer to MVS/ESA SP V5 Initialization and Tuning
Reference.

7.4.2 IODF Statement

Figure 256 shows the fields of the LOADxx IODF statement.

<table>
<thead>
<tr>
<th>Columns</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 9</td>
<td>‘IODF’</td>
</tr>
<tr>
<td>10 - 11</td>
<td>A 2-character IODF suffix</td>
</tr>
<tr>
<td>13 - 20</td>
<td>The 1- to 8-character high-level qualifier (HLEV) for the IODF data set name.</td>
</tr>
<tr>
<td>22 - 29</td>
<td>The 1 to 8 character OS Configuration ID (OSRN).</td>
</tr>
<tr>
<td>31 - 32</td>
<td>The 2-character EDT identifier. (Default: ‘00’)</td>
</tr>
<tr>
<td>34</td>
<td>A single-character that tells MVS whether to load all the dynamic device support code in SYS1.NUCLEUS or only those modules that are required for the dynamic devices defined in your IODF. A ‘Y’ means that the system should load all of the device support code (DSC).</td>
</tr>
</tbody>
</table>

Figure 256. LOADxx - IODF Statement Syntax

7.4.2.1 IODF Suffix

The IODF suffix is the 2-digit hexadecimal number that is part of the IODF name (hlev.IODFxx), or 2 blanks, or two asterisks. The blanks and asterisks are
discussed in 7.5.2, “IODF Processing When Information Is Missing” on page 203.

7.4.2.2 High Level Qualifier (HLEV)

The 1- to 8-character high-level qualifier (HLEV) of the IODF data set name should be specified in the IODF statement. If the LOADxx member resides in
SYSn.IPLPARM, and if the high-level qualifier name in columns 13-20 of the IODF statement is left blank, the default ‘hlev’ is SYSn, the same as the
SYSn.IPLPARM that the LOADxx member was found in. If the LOADxx member was found in a SYS1.PARMLIB data set, the ‘hlev’ field has no default value. If
the ‘hlev’ field value is not provided and LOADxx resides in SYS1.PARMLIB, a wait state is loaded.

### 7.4.2.3 Operating System Configuration ID (OSRN)

This identifier (up to eight characters in length) is used to select the required MVS configuration from the IODF.

### 7.4.2.4 EDT ID

The Eligible Device Table identifier establishes which EDT should be used at IPL time. If the EDT ID is omitted, MVS assumes a default EDT of ‘X’00’. If EDT ‘X’00’ does not exist in the IODF data set, WAIT 204 is loaded.

### 7.5 IODF Processing at IPL Time

This section describes IODF processing when the IODF ‘hlev’ qualifier, IODF suffix, or the Operating System Configuration ID has been omitted. The system checks to determine whether an IODF ‘hlev’ was specified in LOADxx. If a high-level qualifier is specified, the IPL process continues with IODF suffix checking. If a high-level qualifier is not specified, the system determines whether the LOADxx member is from SYSn.IPLPARM. If the LOADxx was found in SYSn.IPLPARM, the high-level qualifier defaults to SYSn of SYSn.IPLPARM. If the LOADxx member was found in SYS1.PARMLIB, the system cannot determine the default high-level qualifier and enters a disabled WAIT 0B1 RC009. Figure 257 shows the decision process.

![Figure 257. IODF High-level Qualifier](image)

202 HCD Primer
7.5.1 IODF Default Processing

In the case where both the operating system configuration identifier and IODF suffix have been specified, MVS searches the IODF volume to find the specified IODF. If it is found, MVS checks to see whether the IODF contains a processor configuration with a token that matches the processor token stored in the channel subsystem (HSA). If a token match is found, both hardware and software changes are allowed. If the system finds the specified IODF, but the IODF does not contain a processor token that matches the token in the HSA, the system will IPL; however, IOS505A is issued indicating that Dynamic I/O Configuration changes are not allowed since the hardware and software configuration do not match. In this case, software-only changes are allowed until an IODF that contains the appropriate matching processor token is activated. If MVS cannot locate an IODF with the specified IODF suffix and configuration ID, it enters a disabled WAIT 0B1. Figure 258 illustrates the decision process.

![Figure 258. IODF Suffix and Configuration ID Specified](image)

7.5.2 IODF Processing When Information Is Missing

This section describes IODF processing when either the IODF suffix or the Operating System Configuration Identifier (OSRN) (or both) are incompletely specified.

7.5.2.1 Specifying ** As the IODF Suffix

When the IODF suffix is specified as **, MVS uses the IODF that was active prior to the current IPL. If you are IPLing for the first time, MVS is unable to find a current IODF. The IPL proceeds as if the IODF suffix were left blank.

If you also specify an OS configuration ID in the IODF statement, the IODF may contain multiple OS configurations, and MVS will use the configuration specified. If you do not specify an OS configuration and the IODF contains more than a single configuration, MVS loads a disabled WAIT 0B1.
7.5.2.2 IODF Suffix Omitted

If an OS configuration identifier has been specified, and an IODF suffix is omitted, MVS searches all IODFs on the IODF device (specified in the L2 field of the OPRCTL frame) that have the IODF ‘hlev’ qualifier specified in LOADxx (or uses the default ‘hlev’ qualifier). MVS searches for a match with the specified OS Configuration ID. The search is done in numerically ascending order of the IODF data set name. The decision process is shown in Figure 259. As a result of the search:

- If an IODF is found that contains the operating system configuration ID and a processor token that matches the current processor token stored in HSA, this IODF is used. Since the IODF contains a matching token, the hardware and software definitions are synchronized. Dynamic I/O configuration changes are allowed for both the hardware and software.

- If no IODF is found that contains a matching processor token, the first IODF found that contains the specified operating system configuration identifier is used. The hardware and software definitions are out of synchronization. Message IOS505A is issued. Software-only changes can be implemented until the hardware and software definitions are synchronized. (This out-of-synchronization condition can be rectified after IPL by using the MVS Activate command or the HCD Activate function to activate an IODF that contains a processor token that matches the one stored in HSA.)

- If no IODF can be found that contains the specified configuration identifier, MVS loads a WAIT 0B1 RC006.

![Figure 259. IODF Suffix Omitted](image-url)
7.5.2.3 Operating System Configuration ID Omitted
If the IODF suffix is specified in LOADxx, but the OS configuration ID is omitted, the software searches for the IODF with the specified suffix. The decision process is shown in Figure 260. As a result of the search:

- If the IODF contains a single operating system configuration identifier, then it is used:
  - If this IODF contains a processor token that matches the one stored in the HSA, then both hardware and software dynamic I/O changes are allowed after IPL.
  - If this IODF does not contain a processor token that matches the one stored in the HSA, it is used, but only software dynamic I/O configuration changes to the operating system are allowed.

- If the specified IODF contains multiple OS configuration identifiers, MVS enters a disabled WAIT 0B1 RC007.

![Figure 260. IODF Operating System Configuration ID Omitted](image)
Both Operating Configuration ID and IODF Suffix Omitted

If an installation omits both the IODF suffix and the operating system configuration identifier, MVS searches the IODF volume for all IODFs that have the same high level-qualifier as the one specified in the LOADxx member. The search order is in ascending order from X’00’ to X’FF’; for example, hlev.IODF00, hlev.IODF01, ....,hlev.IODFFF.

MVS searches for an IODF containing a single configuration ID. The software checks to determine whether that IODF contains a processor definition that matches the current hardware configuration (that is, the software checks that the processor token in the IODF matches the token in HSA). MVS uses the first IODF that it finds with a single configuration identifier and a processor token that matches the token stored in HSA. In this case, the hardware and software configuration are synchronized. Hardware and software dynamic configuration changes are allowed.

If MVS cannot find an IODF that contains a processor token that matches the token stored in HSA, it chooses the first IODF that contains a single operating system configuration. Message IOS505A is issued at IPL time, indicating that the hardware and software definitions are not synchronized. In this case, dynamic I/O configuration changes can be made only to the software I/O definition. (You can rectify this out-of-sync condition after IPL by using the MVS/HCD activate command to activate an IODF that contains a processor token that matches the one stored in HSA.)

If the system cannot find an IODF that contains only one operating system configuration, then MVS enters a disabled WAIT 0B1. Figure 261 illustrates the decision process.
At IPL time, MVS checks to see whether the IODF contains a processor token that matches the corresponding token in HSA. If a matching token is found, then both hardware and software I/O configuration changes are allowed during the life of the IPL. If a matching token is not found, MVS issues message IOS505A and hardware and software are out of sync. Software-only changes are allowed until the hardware and software are back in sync. This requires a software-only activation of an IODF that has a matching processor token (this IODF has a matching processor I/O configuration).

See also 8.4.5, “Configuration Tokens” on page 217 and 8.7.6, “Details about Tokens” on page 234.

### 7.6 IPL Restructure

This section describes changes to the IPL process when using an IODF.
7.6.1 SQA Considerations

When the I/O configuration is loaded from an I/O definition file, the UCBs no longer reside in the nucleus. They reside in SQA. UCBs are built dynamically during the IPL process and placed in SQA. You do not have to specify additional SQA for the initial I/O configuration as the amount required is calculated at IPL time and an adjustment made to the amount requested by the user. You do, however, have to ensure that there is adequate SQA to allow for dynamic I/O configuration growth after the IPL:

- 150 bytes are required below 16MB per device.
- 48 bytes are required above 16MB per device.

See the SQA parameter in the IEASYSxx member of SYS1.PARMLIB.

7.6.2 EDT

During the IPL process, the EDT is identified from the LOADxx member. When the I/O configuration is defined using an IODF, the EDT no longer resides in the nucleus. The EDT (similar to the UCBs) is built dynamically at IPL time from the information in the IODF.

7.6.3 HSA

If you expect to make dynamic configuration changes, you must specify a percentage expansion for the HSA. The amount of HSA that is required by the channel subsystem depends on the configuration definition, and the processor and support levels. This value can only be changed at POR.

7.6.4 EMIF

EMIF also requires that an expansion factor be specified. This value and its specification depends on your processor. Refer to the processor manual for details.

7.6.5 CMBs

The CMB parameter in the IEASYSxx member of SYS1.PARMLIB should be specified such that sufficient storage is available to build channel measurement blocks for devices that may be added by future dynamic changes. Refer to MVS/ESA V5 Initialization and Tuning Reference for details.

7.7 Common IPL Error Situations

The following table summarizes some common IPL error situations along with an explanation of each problem and the associated corrective action.

<table>
<thead>
<tr>
<th>Wait State</th>
<th>Explanation and corrective action</th>
</tr>
</thead>
<tbody>
<tr>
<td>088</td>
<td>IPL could not find the LOADxx member specified. Specify the correct LOADxx suffix.</td>
</tr>
<tr>
<td>0B0</td>
<td>The system could not recognize the IODF specified in the LOADxx member.</td>
</tr>
<tr>
<td>0B1</td>
<td>Examine reason code:</td>
</tr>
</tbody>
</table>
RC001 The IODF was not found.
Verify that the correct device number was specified on the load parameter.
Verify that the IODF data set name specified in LOADxx is correct.

RC002 The configuration ID is not found in the IODF.
Verify that you have correctly specified the configuration ID in LOADxx.
Change the LOADxx member to specify another IODF that has a copy of that configuration ID.

RC007 The configuration ID was blank in the LOADxx, but there was more than one configuration ID defined in the IODF.
Specify a configuration ID in LOADxx or
 Specify an IODF with only one configuration ID.

RC008 IODF suffix not valid.
Specify a valid IODF suffix.

RC009 IODF HLQ not valid.
Specify a valid high-level qualifier on the IODF statement in LOADxx.

0B2 No devices found in the IODF.
Specify another IODF for IPL that contains devices defined.

0B3 IPL found incorrect information in the load parameter.
Specify a correct device number in the first four positions of the load parameter.

204 EDT identifier does not exist in the IODF, or no EDT ID is specified on the IODF statement and the system assumed the default of 00, but EDT 00 is not defined in the specified IODF.
Specify a correct EDT identifier on the IODF statement.
Chapter 8. Dynamic I/O Reconfiguration

An installation may dynamically change the I/O configuration without causing a system outage. This chapter presents the following dynamic I/O configuration topics:

- Overview
- Concepts
- Storage requirements
- Preparations
- Migration
- Usage
- Activation
- Examples

For detailed information on Dynamic I/O reconfiguration, refer to:

- MVS/ESA Hardware Configuration Definition: User’s Guide
- MVS/ESA Device Validation Support
- MVS/ESA Hardware Configuration Definition: Planning

8.1 Overview

Dynamic I/O Reconfiguration is the ability to select a new I/O configuration definition without having to perform a POR of the hardware or an IPL of the MVS/ESA system. It allows an installation to add, delete, or modify the definitions of channel paths, control units, and I/O devices to the software and hardware configurations. You can change the I/O configuration definitions for both software and hardware or for software only. It also allows you to dynamically change the Eligible Device table (EDT) and the Device Preference List. In order to use Dynamic I/O Reconfiguration, Hardware Configuration Definition (HCD) must be used to define the configuration.

Dynamic I/O Reconfiguration has the following benefits:

- It increases system availability by allowing you to change the I/O configuration while MVS/ESA is running, thus eliminating the POR and IPL for selecting a new or updated I/O configuration.
- It allows you to make I/O configuration changes when your installation needs them, rather than wait for a scheduled outage to make changes.
- It minimizes the need to logically define hardware devices that do not physically exist in a configuration (also known as over-defining a configuration).

8.2 Concepts

This section introduces and explains a number of dynamic reconfiguration management concepts. These concepts and terms are used in subsequent sections of this chapter when discussing Dynamic I/O Reconfiguration:

- Device types

  MVS/ESA treats device control information (for example UCBs) differently depending upon whether the device can be dynamically reconfigured or not.
• Hardware System Area (HSA)
   In order to support Dynamic I/O Reconfiguration, it may be necessary to
   reserve space in HSA to allow room for the addition of I/O subchannels
   (devices).

• Eligible Device Table (EDT)
   During Dynamic I/O Reconfiguration it is possible to also change the EDT.

### 8.2.1 Types of Devices

Each device type is represented to the software by a unit information module
(UIM), which is included in the product that contains the device support code.
The UIM specifies whether the device type supports dynamic I/O configuration.
From the UIM specification and the device definition, devices may be:

- Static
- Dynamic
- Installation-static

For information about how to determine whether a device is defined as dynamic
or static refer to 4.11.4, “Determining Whether a Device Is Dynamic or Static” on
page 129. For a description of how to change a device to be defined as
dynamic, refer to 4.11.1, “Changing the Dynamic Parameter” on page 122.

For more information about the type of devices, refer to MVS/ESA V5 Hardware
Configuration Definition: Planning.

#### 8.2.1.1 Static Devices

A static device is a device whose device type as defined in its UIM does not
support Dynamic I/O Reconfiguration. Static devices can be added to the
hardware configuration definition while MVS/ESA is running, and in an OS
configuration they can be activated dynamically. To be available to the
operating system, however, requires an IPL. UCBs for static devices can be
accessed using either the new UCB services or using old methods (through the
CVT, for example).

#### 8.2.1.2 Dynamic Devices

A dynamic device is a device whose device type as defined in its UIM supports
dynamic I/O configuration. In order to dynamically add, modify, or delete such
devices while MVS/ESA is running, it is also necessary that the device be
defined as dynamic by HCD. Dynamic device control information can be
accessed only by using the new UCB services.

#### 8.2.1.3 Installation-static Devices

An installation-static device is a device whose device type as specified in its UIM
supports dynamic I/O configuration, but which you have defined as
DYNAMIC=NO in the HCD definition. Installation-static devices can be
dynamically added to the software I/O configuration definition, but cannot be
modified or deleted while MVS/ESA is running. The control information for
installation-static devices can be accessed using either old UCB services or the
new ones. Defining devices as installation-static should be considered as an
interim measure until all the programs accessing their UCBs have been
converted to the new UCB services.

**Note:** Modifying or deleting an installation-static device requires two separate
dynamic I/O configuration changes:
1. Change the installation-static device to dynamic (by activating a new IODF that defines the device as dynamic). No other device characteristics for that device can be changed on the redefinition activation.

2. Delete or modify the dynamic device (by activating another IODF that contains the appropriate changes to the device). If the device is being modified, and you want it to be changed back to Installation-static after the change, you can do this at the same time that other changes are being activated by specifying DYNAMIC=NO as part of the change.

### 8.2.2 Hardware System Area (HSA)

When you perform a POR, the hardware I/O configuration definition is loaded from an IOCDS into the HSA. When you activate a new configuration, HSA is updated to reflect the new hardware I/O configuration definition. If you plan to use dynamic I/O reconfiguration to add equipment to your configuration, you must specify an expansion factor for the HSA size before initiating the POR. The expansion factor defines how much additional HSA storage is reserved for future dynamic I/O configuration changes. See 8.4.2, “Processor Configuration Frame” on page 215 for information on specifying the expansion factor.

### 8.2.3 Eligible Device Table (EDT)

Usually, MVS/ESA uses one EDT to process allocation requests. However, when you dynamically change your system’s software I/O configuration definition, MVS/ESA may have to use two EDTs to process the change:

- The primary EDT processes all current and new allocation requests. MVS/ESA runs with only the primary EDT until you make a dynamic I/O configuration change. MVS/ESA activates a new primary EDT for the new I/O configuration, which makes the former primary EDT the secondary EDT.
- The secondary EDT receives no new allocation requests. The system deletes the secondary EDT when it finishes the allocation requests issued before the dynamic I/O change.

### 8.3 Storage Requirements

A Dynamic I/O Reconfiguration environment places an additional demand on storage. It is important to review these additional storage requirements with the capacity planning personnel as part of the initial planning phase. Parameters for the following system areas and control blocks require consideration:

- **System Queue Area**

  The installation must ensure that there is sufficient system queue area (SQA) storage available for any additional devices that are to be dynamically added to the configuration. When a configuration is activated, each device in the configuration has a UCB built for it. The UCB resides in the SQA. An average UCB requires 150 bytes of storage below 16MB and 48 bytes above 16MB. For example, if 16 new devices are added to the system, an additional 2400 bytes of SQA and 768 bytes of ESQA are required for the new UCBs. SQA size is determined by the installation and set in SYS1.PARMLIB(IEASYxx). Refer to MVS/ESA SP V5 Initialization and Tuning Reference for details. At IPL, the system determines from the current I/O configuration how much SQA and ESQA is required for the installation’s
UCBs. This amount of SQA and ESQA is then increased by the amount specified in IEASYSxx.

If you activate a new configuration, the SQA must be large enough to contain all the UCBs in both the old and new configurations during the activation. If there is a problem during activation of the replacement configuration, MVS/ESA needs this storage to recover and reestablish the UCBs that existed before the attempt to change the configuration.

If you define the devices with LOCANY=Yes, the UCBs are placed above 16MB, which solves the storage constraint. You can move the UCBs above 16MB via a software-only change.

- **Hardware System Area**

  In order to dynamically change the hardware I/O configuration, there must be sufficient free space available in the Hardware System Area (HSA) to accommodate the new definitions. IBM ES/9000 processors allow you to define an expansion factor for the HSA when you do a POR. This is done from the CONFIG frame of the system console. The ‘Percent Expansion’ value represents the portion of the HSA that is reserved for the dynamic activation of a new hardware I/O configuration. It is based on the amount of the HSA that will be used to accommodate the I/O configuration in the IOCDS that is to be the target of the next POR.

  For example, if the IOCDS used for the POR has 2000 I/O devices defined in it, and you specify a Percent Expansion factor of 20, enough HSA is reserved to add approximately 400 additional devices.

  Note that this cannot be changed without a POR. In addition, if you were to start with a minimal configuration, say 100 devices, and you knew that you wanted to dynamically add 1000 more, you would specify the maximum value of 999, which means that you want to reserve 999 percent or 9.99 times the amount of HSA that is required for the 100 devices in the current IOCDS. Do not forget, however, to reset this value prior to the next POR, because if you do not, and you added the 1000 devices, the amount of HSA that will be reserved is based on the amount required for 1100, devices and you probably do not plan to add 999 percent more.

- **Channel Measurement Block**

  The channel measurement block (CMB) is used to accumulate I/O measurement data for devices that you want to measure. You have to specify, on the CMB parameter in the IEASYSxx member of SYS1.PARMLIB, the sum of the number of devices that you want to measure that are not DASD or tape, plus the number of devices that you plan to add dynamically to the configuration definition used at IPL and that you wish to measure.

### 8.4 Preparations

This section discusses the preparations you must make for Dynamic I/O Reconfiguration. The major topics are:

- Processor preparation
- Processor configuration frame
- IPL
- Security considerations
- Configuration tokens
8.4.1 Processor Preparation

Before performing the POR, you must specify on the system console CONFIG frame or the HMC Customize Activation Profile panel the percentage expansion factor for HSA, and the option required to enable I/O Modifications. You must select both before you are considered to be on a machine that allows dynamic I/O changes. The expansion factor specifies the amount you can increase the size of your configuration without doing a POR. Specifying this value may cause the HSA to increase in size. For example, if you ordinarily have an I/O configuration consisting of 1000 devices, specifying an expansion of 20% reserves enough HSA to allow you to add approximately 200 devices dynamically (20% of 1000).

Before you can use the dynamic activate function you have to download the IOCDS from the production IODF. Then you have to perform a POR of the system using that IOCDS. This is because HCD writes the configuration token to the IOCDS, which is required for all configuration changes.

8.4.2 Processor Configuration Frame

This example shows you the steps to select the expansion factor for the HSA and to enable I/O changes at the configuration frame. The system console for an IBM ES/9121 is used for this example. Depending upon model and support level, your configuration frame may look differently. Proceed as follows:

1. Select the Config frame from the Index frame or invoke it by entering F CONFIG from the command line. This displays the panel shown in Figure 262 or Figure 263.

![Figure 262. ES/9000 CONFIG Frame (Non-EMIF Capable Processor)](image)
2. Enter H1 on the command line. This causes the cursor to move to the field at the end of the line Percent Expansion. You can now enter a percentage value (20 in this case) to specify the amount of HSA storage you want to reserve for dynamic I/O changes. Note that the Percent Expansion can be changed only at ‘POR Required’ time.

Confirm the change by pressing Enter.

3. Enter H2 on the command line and press Enter to allow dynamic modifications (this places an arrow to the left of the 2 as shown in Figure 262). The setting can be toggled ON and OFF before or after ‘POR complete’ time.
8.4.3 IPL

To use Dynamic I/O Reconfiguration Management for hardware and software changes, you must IPL using an IODF that contains the processor configuration that matches the one in the HSA. This IODF can be either the one containing the processor configuration used when downloading the IOCDS, and then used at the last POR, or the one used for a successful hardware activate. Additionally, dynamic I/O changes can be made only if the IODF used at IPL is cataloged on the system being IPLed. However, you can IPL using an IODF that is not cataloged; in this case, IPL issues a warning message that dynamic I/O changes are not allowed. See Chapter 7, “MVS/ESA IPL Procedure” on page 197 for more details.

8.4.4 Security Considerations

The security administrator must authorize HCD users to activate I/O changes. Before anyone can use the Activate New Configuration panel, the security administrator must authorize that user to the MVS.ACTIVATE profile of the OPERCMDS class with UPDATE access. Read access allows you to use the test mode of the Activate function.

8.4.5 Configuration Tokens

After a system has been IPLed, there are four separate descriptions of the I/O configuration, any one of which can be altered independently of the others. These configuration descriptions are located in the following components:

- The IODF used to create the IOCDS
- The IOCDS used at POR
- The HSA
- The MVS/ESA SQA/ESQA

In order to allow dynamic changes to be made to both the hardware and software configurations, and for those changes to be recoverable in case of an error, it is necessary for all these definitions to be consistent. Consistency is maintained through the use of tokens. A processor token is created as part of the processor definition in HCD and is placed in the IODF. If the processor definition is changed, a new processor token is created. The processor token is propagated to the IOCDS created from the IODF. After a POR, the processor token from the IOCDS is placed in the HSA as part of the I/O definition. During IPL, MVS/ESA obtains the processor token from the HSA and compares it to all processor configuration tokens in the IODF, looking for a match. It also checks to see that the IODF used is cataloged on the IPLed system. During dynamic reconfiguration, Dynamic I/O Reconfiguration Management also compares tokens to ensure that it is safe to make hardware changes from MVS/ESA.

In addition each IODF is uniquely identified by an IODF token.

Dynamic reconfiguration may be limited if tokens do not match or if MVS/ESA is not able to verify a token (for example, if the production IODF used at IPL has been deleted). These restrictions may be as follows:

- If the IODF token of the currently active IODF does not match the token of the data set that is considered to be the current IODF, no activation is allowed. This is because, without a token match, there is no guarantee that the IODF reflects either the hardware or software definitions. This situation is serious and requires an IPL for the system to be capable of dynamic reconfiguration again.
- If the IODF token matches, but the hardware token in the HSA does not match the processor token of a processor record in the currently active IODF, only software changes are allowed. This situation can be remedied by reactivating the IODF that corresponds to the current hardware definition.
- If the IODF token matches, and the hardware token in the HSA matches the processor token of a processor record in the currently active IODF, both, hardware and software changes are allowed.

See also 8.7.6, “Details about Tokens” on page 234 for details about tokens.

8.5 Migrating to Dynamic I/O Configuration

Before you use the dynamic I/O configuration function in your installation, note the following migration considerations:

- Verify that the appropriate levels of hardware and software are installed.
- Convert the I/O configuration from MVSCP to HCD.
- Convert any installation-written UIMs.
- Convert any programs that reference UCBs.
- Use HCD to create a new IOCDS.
- POR the processor.
- IPL the system using the IODF that was used to download the IOCDS. Also insure that all device-support modules are included for any devices that may not be in your configuration, but that are likely to be added dynamically later. This can be done by defining, in the operating system configuration to be IPLed, at least one device of the type that will be added, even though the device does not physically exist; or you can specify 'Y' in column 34 of the IODF statement in the LOADxx member of the SYS1.PARMLIB or SYSn.IPLPARM data set that is to be used for the IPL.

8.6 Using Dynamic I/O Configuration

This section provides information about the steps to follow to change the I/O configuration definitions for software only or for both hardware and software.

8.6.1 Software-Only Changes

A software-only change modifies only the software control structures, such as the unit control blocks (UCBs) and the Eligible Device Tables (EDT).

Making software-only changes is useful in the following situations:

- When the software does not match the hardware I/O configuration, to synchronize hardware and software so that a full change is possible later.
- When only EDT (esoteric names or device preference values) changes or changes to the device parameters are required.
- When multiple logical partitions are running in LPAR mode (For details, see 8.6.3, “LPAR Considerations,” below).
- When MVS/ESA is a guest operating system running under VM.
- When MVS/ESA is running on a processor that does not support dynamic I/O reconfiguration changes.
To make software-only changes, follow these steps:

1. For each device that you plan to add, make sure its device support code was loaded at the last IPL.
2. For each device that you plan to delete, make sure that it is not needed by any application running on the processor. In LPAR mode, this includes applications running in any logical partition of your processor.
3. Describe the new I/O configuration definition in an IODF that you create with HCD.
4. Activate the new IODF either from the console or from HCD.

8.6.2 Software and Hardware Changes

A software and hardware change modifies both the software and hardware control structures (UCWs, UCBs, and EDTs). To make software and hardware changes, follow these steps:

1. For each device that you plan to add, make sure its device support code was loaded at the last IPL.
2. For each device that you plan to delete, make sure that it is not needed by any application running on the processor. In LPAR mode, this includes applications running in any logical partition of your processor.
3. For each device or channel path that you plan to delete, make sure that it is offline.
4. Describe the new I/O configuration definition in an IODF that you create with HCD.
5. Activate the new IODF.
6. Physically remove the I/O components that you have dynamically deleted. (Omitting an I/O component from an IODF deletes that component’s definition from the I/O configuration.)
7. Install the new I/O components that you have dynamically added (Including an I/O component in an IODF adds that I/O component’s definition to the I/O configuration). As required, configure the channel paths, format the I/O devices, and vary the I/O components online.

8.6.3 LPAR Considerations

If the processor is running in LPAR mode, a MVS system running in any of the logical partitions can make dynamic I/O configuration changes that affect the hardware configuration for all the logical partitions.

To activate dynamic I/O changes in LPAR mode, follow these steps:

1. In all logical partitions except one, make software-only changes, if required.
2. In the remaining logical partition, make both hardware and software changes.
Notes:

1. In order to delete any I/O components from an LPAR configuration, you must specify the FORCE option.

2. If any logical partitions are running operating systems other than MVS/ESA SP Version 4 Release 2 (or later), those logical partitions might be affected by the dynamic I/O changes. Therefore, do not delete any I/O component required by any of those partitions without first making sure that the I/O component is offline.

8.6.4 Activating the IODFs

To activate a new IODF, you can use either the HCD panels or the ACTIVATE operator command. When you activate a new configuration through the HCD panels or the ACTIVATE operator command, the HSA is updated to represent the new hardware I/O configuration definition. If you use HCD, you can simultaneously create a new IOCDS and switch the default IOCDS (the one that is loaded at the next POR). This makes it possible to keep the active configuration synchronized with the IOCDS which is loaded at the next POR. You cannot write a new IOCDS using the ACTIVATE operator command.

8.7 Activating a New Configuration

The following sections describe how to prepare for dynamic activation and how to perform the activation.

For activating new configurations sysplex-wide, refer to Chapter 9, “HCD in a Sysplex Environment” on page 245.

8.7.1 Preparing for Dynamic Activation

For a Dynamic I/O Configuration hardware change to be successful, the actual I/O configuration support in the ES/9000 processor must be matched by a supporting I/O configuration definition in the active IODF. A token value is used to determine whether these two I/O configuration definitions are the same. The token value is stored with the ES/9000 I/O configuration in the HSA (the part of the HSA that makes up the ES/9000 Channel Subsystem), and a token value is stored in a production IODF. If these two token values are the same, then the hardware and software are said to be ‘in-synchronization’ (in sync). These two tokens are known as the ‘processor token’ in HSA and the ‘processor token’ in the IODF. If these two processor tokens have the same value, then the software (MVS/ESA and HCD) has an awareness of the ES/9000 processor I/O configuration definition based on the I/O configuration definition in the active production IODF with the matching processor token.

Issue the MVS/ESA command D IOS,CONFIG to determine the Active IODF, the OS Configuration ID, the EDT ID, and the hardware Processor Token. A display similar to the one in Figure 264 should be shown.
Use the display from the `D IOS,CONFIG` command to determine:

- The active IODF (I/O definition file) data set name:
  
  \[
  \text{ACTIVE IODF DATA SET} = \text{SYS6.IODF04}
  \]

- The operating system configuration ID:
  
  \[
  \text{CONFIGURATION ID} = \text{L06RMVS1}
  \]

- The MVS/ESA current EDT value:
  
  \[
  \text{EDT ID} = \text{01}
  \]

- The processor ID name from the processor token:
  
  \[
  \text{TOKEN: PROCESSOR}\hspace{1cm} \text{SOURCE: P201}
  \]

- The complete hardware processor token:
  
  \[
  \text{TOKEN: PROCESSOR DATE TIME DESCRIPTION}\hspace{1cm} \text{SOURCE: MVSBL720 93-04-21 17:52:24 SYS4 IODFCC}
  \]

You receive the same information if you use HCD to view the active configuration:

1. Specify the active production IODF data set name on the HCD Primary Task Selection panel and select `Activate or process configuration data`.
2. Select `View active configuration` from the next panel.

   HCD shows you in addition what kind of dynamic changes are allowed.

---

**Figure 264. MVS/ESA Command D IOS,CONFIG**

**Figure 265. View Active Configuration Panel**
8.7.2 Performing a Dynamic Activation

If you have made sure that the hardware and software definitions are in sync, you can activate a new configuration using the production IODF representing the new configuration.

In a basic environment perform a test activate followed by a hardware/software activate using either the MVS/ESA ACTIVATE command or the HCD Activate function.

An LPAR environment requires an activation step in each system image in the processor complex.

Perform a test activate followed by a software-only activate in all but the last partition, using either the MVS/ESA ACTIVATE command or the HCD Activate function.

In the last partition perform a test activate followed by a hardware/software activate, using either the MVS/ESA ACTIVATE command or the HCD Activate function.

The following four examples use the MVS/ESA ACTIVATE command:

- ACTIVATE IODF=yy,SOFT,TEST (test software activate)
- ACTIVATE IODF=yy,TEST (hardware and software test activate)
- ACTIVATE IODF=yy (hardware and software activate)
- ACTIVATE IODF=yy,FORCE (hardware and software activate, hardware deletes involved and processor mode is LPAR)

Each of the activate examples uses the default values for the CONFIG. ID, EDT and PROC. ID.

Refer to MVS/ESA SP V5 System Commands for the complete syntax of the MVS/ESA ACTIVATE command.

The following examples presume three logical partitions. Therefore, the activates are a software-only change in the first logical partition, a software-only change in the second logical partition, and a hardware/software change in the last partition. The following figure illustrates this.

The actions in the partitions are as follows:

1. In the first logical partition (LPa) enter the MVS/ESA commands, ACTIVATE TEST (optional), followed by ACTIVATE SOFT (software only), or use the HCD
Activate configuration data task and further select Activate configuration dynamically and Activate software configuration only:

- The following is an example of the MVS/ESA commands Display IOS,CONFIG, Activate Test and Activate Software only entered on the MVS/ESA system running in the first logical partition:

  D IOS,CONFIG (display the current I/O configuration definition environment)
  ACTIVATE IODF=yy,SOFT,TEST (test software-only activate)
  ACTIVATE IODF=yy,SOFT (software-only activate)
  D IOS,CONFIG (display the current I/O configuration definition environment)

  The results of the MVS/ESA Display IOS,CONFIG command are shown on the MVS/ESA console and in the MVS/ESA system log. See Figure 266.

  - d ios,config
    IOS505E 18.12.16 I/O CONFIG DATA nnn C
    ACTIVE IODF DATA SET = SYS4.IODFCC
    CONFIGURATION ID = MVSTEST EDT ID = 02
    TOKEN: PROCESSOR DATE TIME DESCRIPTION
    SOURCE: MVSBL720 93-04-21 17:52:24 SYS4 IODFCC
    IEE612I CN=01 DEVNUM=C40 SYS=MVSTEST

  Figure 266. MVS/ESA Console Display - Display IOS,CONFIG Command Results

  The results of the MVS/ESA ACTIVATE SOFT,TEST (software-only test) request are shown on the MVS/ESA console and in the MVS/ESA system log. See Figure 267.

  - activate iodf=cd,soft,test
    IOS500I ACTIVATE RESULTS nnn C
    TEST DETECTED NO CONDITIONS WHICH WOULD RESULT IN ACTIVATE FAILURE
    NOTE = 0100,SOFTWARE-ONLY CHANGE
    COMPID=SC1C3
    IEE612I CN=01 DEVNUM=C40 SYS=MVSTEST

  Figure 267. MVS/ESA Console Display - Activate TEST Command Results

  The results of the MVS/ESA ACTIVATE SOFT (software only) request are shown on the MVS/ESA console and in the MVS/ESA system log. See Figure 268.

  - activate iodf=cd,soft
    IOS500I ACTIVATE RESULTS nnn C
    ACTIVATE COMPLETED SUCCESSFULLY
    NOTE = 0100,SOFTWARE-ONLY CHANGE
    COMPID=SC1C3
    NOTE = 010B,H/W AND S/W CONFIGURATION DEFINITIONS ARE NOW OUT OF SYNC
    COMPID=SC1C3
    IEE612I CN=01 DEVNUM=C40 SYS=MVSTEST

  Figure 268. MVS/ESA Console Display - Activate SOFT Command Results

  The results of the MVS/ESA Display IOS,CONFIG command are shown on the MVS/ESA console and in the MVS/ESA system log. See Figure 269.
Figure 269. MVS/ESA Console Display - Display IOS,CONFIG Command Results

Details of adds, deletes, and changing from static to dynamic are shown only in the MVS/ESA system log. See Figure 270.

Figure 270. MVS/ESA System Log - Activate Command Results
• Figure 271 and Figure 272 show an example of the HCD dialog panels required to activate a software configuration only change. The HCD dialog session must be with the system that is required to perform the activation process.

• If your installation is configured as a sysplex, you can use the sysplex-wide activate function of HCD. This allows you to initiate all activation requests from one HCD. For more information refer to Chapter 9, “HCD in a Sysplex Environment” on page 245.

![Diagram of HCD dialog panels]

**Figure 271. HCD Software Only Activate Selection**

![Diagram of HCD dialog panels]

**Figure 272. HCD Software Only Activate**

2. In the second of the three logical partitions (LPb), enter the MVS/ESA commands, ACTIVATE TEST, followed by ACTIVATE SOFT (software only), or use the HCD **Activate configuration data** task and further select **Activate configuration dynamically** and **Activate software configuration only**:

• The following is an example of the MVS/ESA commands Activate test and Activate software only entered on the MVS/ESA system running in the second logical partition.
ACTIVATE IODF=yy,SOFT,TEST (test software only activate)
ACTIVATE IODF=yy,SOFT (software only activate)

• The Activate function for the second logical partition could also have been invoked using HCD. The HCD dialog session must be with the system that is required to perform the activation process.

3. In the third logical partition (LPc), enter MVS/ESA commands ACTIVATE TEST (optional), followed by an ACTIVATE (hardware and software), or use the HCD Activate configuration data task and further select Activate configuration dynamically and Activate new hardware and software configuration:

• The following is an example of the MVS/ESA commands Activate test and Activate hardware and software entered on the MVS/ESA system running in the last logical partition.

ACTIVATE IODF=yy,TEST (test hardware and software activate)
ACTIVATE IODF=yy (hardware and software activate)
ACTIVATE IODF=yy,FORCE (hardware and software activate, hardware deletes involved and processor mode is LPAR)

Note: For an MVS/ESA system running in a logical partition, if the delta difference between the active IODF (source IODF) and the new production IODF (target IODF) involves deletes of channel paths, control units, or devices, the FORCE keyword of the ACTIVATE command is required:

ACTIVATE IODF=yy,FORCE (hardware and software activate hardware deletes involved and processor mode is LPAR)

The results of the MVS/ESA ACTIVATE TEST (hardware and software test) command request is shown on the MVS/ESA console and in the MVS/ESA system log. See Figure 273.

```
- activate iodf=cd,test
IOS500I ACTIVATE RESULTS nnn
TEST DETECTED CONDITIONS WHICH WOULD RESULT IN ACTIVATE FAILURE
REASON=0150,REQUEST CONTAINS DELETE(S), BUT FORCE OPTION NOT SPECIFIED
COMP=SC1C3
```

Figure 273. MVS/ESA Console Display - Activate TEST Command Results

The results of the MVS/ESA ACTIVATE FORCE (hardware and software change) command request is shown on the MVS/ESA console and in the MVS/ESA system log. See Figure 274.

```
- activate iodf=cd,force
IOS500I ACTIVATE RESULTS nnn
ACTIVATE COMPLETED SUCCESSFULLY
```

Figure 274. MVS/ESA Console Display - Activate FORCE Command Results

Details of adds, deletes and changes from static to dynamic are shown only in the MVS/ESA system log. See Figure 275.
The Activate function for the last logical partition (LPc) could also have been invoked using HCD.

Use the HCD Primary Task Selection panel, select the **Activate configuration data** task and further select **Activate configuration dynamically** and **Activate new hardware and software configuration**.

Figure 276 and Figure 277 show an example of the HCD dialog panels to activate a new hardware and software configuration. The HCD dialog session must be with the system that is required to perform the activation process.

1. Activate new hardware and software configuration.
2. Activate software configuration only. Validate hardware changes.
3. Activate software configuration only.
Figure 277. HCD Hardware and Software Activate

It may take several minutes for an activation request to complete.

The results of an HCD activation request are displayed on the Message List panel as shown in the Figure 278.

Figure 278. HCD Activation Results Message

8.7.3 HCD and ESCON Topology - Compatibility

HCD is used to define access to control units on the host processor’s channel paths. For ESCON channel paths there has to be compatibility between the number of control units defined on ESCON links (ESCON Destination Link Addresses - DLAs) from a ESCON channel and the physical topology of the ESCON channel path.

For an OEMI Parallel Channel path there is only one topology and it is called “daisy chaining.”

For ESCON there are two physical ESCON channel path topologies, namely:

- ESCON - Point-to-Point
- ESCON - Switched Point-to-Point
The ESCON channel to the ESCON physical channel path compatibility is based on the number of ESCON to control unit destination links defined for a channel. The rules are as follows:

- When there are no ESCON destination link addresses defined for an ESCON channel, the physically connected ESCON channel path topology must be point-to-point.
- When there is one ESCON destination link address defined for an ESCON channel, the physically connected ESCON channel path topology may be point-to-point or switched point-to-point.
- When there are two or more ESCON destination link addresses defined for an ESCON channel, the physically connected ESCON channel path topology must be switched point-to-point.

The ESCON channel compatibility rules need to be understood when dynamic I/O reconfiguration definition changes are being planned. Depending on the physically connected ESCON channel path topology and the number of destination link addresses currently defined for the channel, dynamic I/O reconfiguration changes that impact this channel may require that the channel be taken physically offline.

Anytime that the current ESCON channel path topology is required to be changed for an ESCON channel, the ESCON channel must first be taken offline.

The following table shows ESCON channel definition change requirements:

<table>
<thead>
<tr>
<th>ESCON Channel Path Definition</th>
<th>Current ESCON Channel Path Topology</th>
<th>New ESCON Channel Definition</th>
<th>Requires Topology Change?</th>
<th>Requires Channel offline?</th>
</tr>
</thead>
<tbody>
<tr>
<td># DLAs = 0</td>
<td>Point-to-Point</td>
<td># DLAs = 1</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td># DLAs = 0</td>
<td>Point-to-Point</td>
<td># DLAs &gt;= 2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td># DLAs = 1</td>
<td>Point-to-Point</td>
<td># DLAs = 0</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td># DLAs = 1</td>
<td>Sw Pt-to-Pt</td>
<td># DLAs &gt;= 2</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td># DLAs = 1</td>
<td>Sw Pt-to-Pt</td>
<td># DLAs = 0</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td># DLAs &gt;= 2</td>
<td>Sw Pt-to-Pt</td>
<td># DLAs = 1</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td># DLAs &gt;= 2</td>
<td>Sw Pt-to-Pt</td>
<td># DLAs = &gt;</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

If dynamic I/O reconfiguration changes are attempted that would cause incompatibility between the ESCON channel definition (for an online ESCON channel) and the current physically connected ESCON channel path topology, then the dynamic I/O reconfiguration attempt will fail.

### 8.7.4 Activating (Switching) IOCDS

Dynamic selection of the new IOCDS can be invoked from either the MVS/ESA console or from HCD. It cannot be invoked from any of the ES/9000 support processor frames.
Switching an IOCDS moves the pointer for the next POR and updates the IOCDS field. It does not make the configuration, stored in the IOCDS, the active one.

The format of the Activate selection from the MVS/ESA console is as follows:

```
ACTIVATE ACTIOCDS=zn  (switch the selection of the IOCDS)
```

If the activation was successful the following message is shown:

```
activate actiocds=a4
IOS500I Activate results 274
ACTIVATE COMPLETED SUCCESSFULLY
```

The newly selected IOCDS automatically becomes write protected.

For the IOCDS activate process (selection of a new IOCDS) to be successful, the processor token in the target IOCDS must match the (new current) processor token in the HSA. This means that the IOCDS that you are switching to supports an I/O configuration definition that is equal to the I/O configuration currently active in the channel subsystem.

If the IOCDS activation is successful:

- The selection indicator on the ES/9000 IOCDSM frame points to the new IOCDS (Figure 279).
- The ‘IOCDS for POR’ name field is updated on the ES/9000 IOCDSM and CONFIG frames.

HCD may also be used to dynamically change (switch) the IOCDS selection pointer. Using HCD, the option to switch the selection can be taken at the same time as the write IOCDS function (download IOCDS) is invoked or as a separate step. Figure 280 through Figure 283 show the selection to switch the IOCDS being made as a separate step.
It may be more common to select the option to switch the IOCDS from HCD when the IOCDS is written. See 4.6.2, "Downloading an IOCDS" on page 101 for more details. To use this option:

1. Select **Activate or process configuration data** from the HCD primary selection menu. This displays the panel shown in Figure 130 on page 100. Here select **Activate configuration dynamically**. This displays the panel shown in Figure 280.

![Figure 280. HCD Activation Selection Panel](image)

2. Specify option 1 and press Enter. This causes the panel shown in Figure 281 to be displayed.

![Figure 281. HCD Selection to Switch IOCDS for Next POR](image)

3. Complete the panel and specify **Yes** for **Switch IOCDS for next POR**. This displays the panel shown in Figure 282.
4. Select the appropriate IOCDS to be used for the next POR by moving the cursor next to the IOCDS row.

The result of the switch IOCDS action is shown on the Message List panel, shown in Figure 283.

8.7.5 Checklist

The following is a list of the steps to go through in order to perform a dynamic I/O reconfiguration. It can be used as a checklist.

1. Make the configuration definition changes.

Make the adds, deletes, and modifications to the currently active production IODF. This forces the creation of a new work IODF based on the contents of the active production IODF.

2. Build a new production IODF.

See 4.6.1, “Creating a Production IODF” on page 96 for details.

The new production IODF data set name high-level qualifier must be the same as the active IODF data set name high-level qualifier if dynamic I/O configuration activations are to be performed. Also, there can be no more than the high-level qualifier and IODFxx in the IODF data set name if the
IODF data set is to be used for dynamic I/O configuration activation (and at IPL time). For example, a production IODF named SYS0.IODF00.PROD would be acceptable to HCD; however you would not be able to IPL from it nor would you be able to activate it dynamically.

3 Activate the I/O configuration changes using the new production IODF.

This is required for each system image using the same production IODF. See 8.7.2, “Performing a Dynamic Activation” on page 222 for details.

4 Update the appropriate IOCDS data set.

See 4.6.2, “Downloading an IOCDS” on page 101 for details.

5 Activate (switch) the IOCDS (select the new IOCDS).

The previous three steps (3, 4, and 5) can be performed as one combined step (for the last system image on an LPAR processor) when using HCD.

6 Update the LOADxx members for each Configuration ID.

Note: Update the LOADxx member or members if more than one MVS/ESA SCP configuration is supported by the new production IODF.

An installation can use one of two methods for updating the LOADxx:

- Update the original LOADxx member or members (the recommended method), but first create an installation backup copy of the current LOADxx and store it in LOADx9 (the installation backup LOADxx).
- Create a new LOADxx member or members. If a new member or new members are created, the IBM ES/9000 frames, OPRCTL - L2 field, or the SYSCTL - A2 field (load parameter) have to be updated for each system image.

7 Create a backup copy of the new production IODF.

See 3.9, “Production IODF Backup” on page 16 for details.

HCD uses the normal catalog management to catalog this backup copy of the new production IODF.

Note: The system catalog management does not allow you to use the same name for both the backup copy of the new production IODF and the original production IODF.

Update the LOADxx member (in data set SYSn.IPLPARM or SYS1.PARMLIB) that supports the selection of this backup production IODF data set. It is recommended that you place the backup copy of the IODF on a different DASD volume. Another SYSn.IPLPARM or SYS1.PARMLIB with the LOADxx members may also reside on this backup IODF DASD volume. The SYSn.IPLPARM data set (or the secondary SYS1.PARMLIB data set) does not have to be cataloged for either the MVS/ESA IPL process or the HCD - Dynamic I/O Configuration process to be successful.

8 Build an IOCP input source and then create a stand-alone IOCP input tape for ES/9000 PCE (Support Processor) recovery support.

See 4.6.3, “Creating an IOCP Input Data Set” on page 103 for details. This tape would be used by the stand-alone IOCP program in case the ES/9000 Support Processor IOCDS data is lost.
9 Update the configuration checking member (CONFIGxx) in SYS1.PARMLIB.

If the installation supports system configuration checking, the SYS1.PARMLIB(CONFIGxx) member or members (if the SYS1.PARMLIB data set is shared between MVS/ESA systems) in each MVS/ESA system must be updated to reflect the current system configuration.

8.7.6 Details about Tokens

In order to determine whether the actual configuration definition contained in the hardware matches the I/O configuration definition contained in the IODF, the hardware configuration token has been introduced. The hardware configuration token uniquely identifies a hardware I/O configuration definition.

A unique system-wide (referred to as “world-wide”) hardware configuration token is necessary, so that HCD can determine that the changes to be applied to the current hardware I/O configuration definition are derived from comparing the target IODF to a current IODF, which contains a representation of the current hardware configuration. If the starting definition cannot be guaranteed, the incremental change that is determined by comparing the source and target IODFs might not be valid, and performing these changes might yield unpredictable results.

This hardware configuration token is created at production IODF build time and stored in the IOCDS when HCD downloads an IOCDS.

When the machine is initially powered on (POR), this hardware configuration token is loaded into the HSA. Any time you attempt to update the hardware configuration definition by activating a new hardware configuration definition, MVS/ESA retrieves the hardware configuration token from the HSA and verifies that the currently active IODF contains a matching hardware configuration token. If it does not, the hardware and software I/O configuration definitions are said to be out of synchronization, and no dynamic hardware changes are allowed. If the currently active IODF does contain a hardware configuration token that matches the one contained in the HSA, the hardware and software I/O configuration definitions are said to be synchronized, and both hardware and software dynamic I/O configuration changes are allowed.

Optionally, you can make configuration changes that affect only the software definition. This option is available regardless of whether the software and hardware I/O configuration definitions are synchronized. Additionally, this capability can be used to restore synchronization as needed.

The format of the hardware configuration token is shown in Figure 284.

<table>
<thead>
<tr>
<th>Processor ID</th>
<th>WWUV</th>
<th>Date</th>
<th>Time</th>
<th>Descriptor Field 1</th>
<th>Descriptor Field 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>16</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Length</td>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 284. Format of Hardware Configuration Token
Issue the MVS/ESA command D IOS,CONFIG to view the hardware configuration token. The token is displayed without the WWUV (world-wide-unique-value), because the WWUV contains unprintable characters.

The first part of the hardware configuration token contains the processor token and consists of the processor ID and a world-wide-unique value. Like the hardware configuration token, the processor token uniquely identifies the configuration for a processor in an IODF. The processor token is saved in the IODF for each processor defined. Whenever a change to a processor configuration is made, a new processor token is created for that processor when building the production IODF. If no changes have been made to a processor configuration, the token remains unchanged in the new production IODF. Thus you can have different IODFs that contain the same processor token.

When downloading an IOCDS for a particular processor, the hardware configuration token is constructed, using the processor token for the designated processor, the date and time the production IODF was built, and the IODF descriptor fields. This hardware configuration token is then stored in the IOCDS.

In reality, when comparing the hardware configuration token, only the processor token is compared.

You can view the hardware configuration token that is associated with the IOCDS in the IOCDS Management frame (IOCDSM). See Figure 285 for an example of the panel. Remember that only the printable part of the token is displayed.

Another token, called the IODF token is kept in the IODF and uniquely identifies a production IODF. Whenever a new production IODF is built - and for any change in a configuration you have to create a new production IODF - this new IODF gets a new IODF token. The IODF token consists of a world-wide-unique value. During an ACTIVATE, the active IODF must be compared with the target IODF to determine the changes to be made. The IODF token ensures that the correct active IODF is used for this compare. If the IODF tokens do not match on an ACTIVATE, the IODF that is supposed to be the active one does not contain the
currently active configuration definition. This IODF cannot be used for an
ACTIVATE and activation is rejected with the message:

```
Currently active I/O definition does not match IODF xxxx, activation rejected
```

This might happen if you delete the active IODF and create a new production
IODF with the same IODF name.

In fact, it is the contents of the IODF that are uniquely identified by its token. For
example, even though you copy the production IODF to another IODF, they both
have the same IODF token. Also, even if you move the production IODF to
another volume or rename it, it still contains the original IODF token.

For the sake of completeness, there is also another token, called the MVS
configuration token. It uniquely identifies an instance of an I/O configuration with
respect to the state of the MVS/ESA control blocks. This token, in combination
with new MVS/ESA services, allows programs to detect I/O configuration
changes synchronously with an attempt to access MVS/ESA related configuration
information.

### 8.8 Dynamic Reconfiguration Examples

This section gives examples of several types of dynamic changes. Examples are
provided for:

- Deleting devices
- Deleting control units
- Deleting channel paths
- Adding devices, control units, and channel paths
- Changing the active EDT

#### 8.8.1 Deleting Devices

To delete devices, follow these steps:

1. Make sure the devices are defined as dynamic.
2. Vary the devices offline.
3. Create a new IODF through HCD that describes the new I/O configuration.
4. Activate the new IODF.

Figure 286 shows an example in which device 0225 is deleted from both the
hardware and software configuration. Note that the numbers in the figure are
keyed to the explanation that follows.
The active IODF was PEREYRA.IODF00. In order to use the ACTIVATE
command, the new IODF must have the same high-level qualifier as
the active IODF and must be cataloged.

The active configuration includes device 0225 and the device is
online.

To delete the device from the configuration, it must be offline.

The ACTIVATE command was used to activate a new IODF containing
the new I/O configuration. The parameter FORCE was used because
the configuration was changed in an LPAR environment. The console
displays messages indicating which devices have been deleted.

### 8.8.2 Deleting Control Units

Follow these steps to delete a control unit:

1. For the control unit that you plan to delete, make sure that none of its
devices are in use by any application.
2. Vary all devices on the control unit offline to MVS/ESA.
3. Create a new IODF through HCD that describes the new I/O configuration,
excluding the definition of the control unit and all devices attached to the
control unit.
4. Activate the new IODF.
Notes:

1. MVS/ESA verifies that the control units are not in use (that all device paths are offline) before deleting the control unit.

2. If the devices attached to the control unit to be deleted are also attached to another control unit that is not being deleted, vary the paths to the devices for that control unit offline and do not delete the definition of these devices in the IODF.

Figure 287 and Figure 288 show an example in which the active IODF includes the following definitions:

- Devices 0200-0207 (3380) are attached to two control units with control unit numbers 0200 and 0201.
- Control unit 0200 is connected to channel path 02.
- Control unit 0201 is connected to channel path 0E.

A new IODF is created without control unit 0201 and then activated. Both the hardware and software configuration definitions are updated. The numbers in the figures are keyed to the explanation that follows.

**Figure 287. Deleting a Control Unit - Varying the Paths Offline**

**Figure 288. Deleting a Control Unit - Activating the IODF**
The active IODF was PEREYRA.IODF00. Note that if you are activating an IODF using the ACTIVATE command, the high-level qualifier (in this case PEREYRA) of the new IODF must be the same as that of the old IODF, and the IODF must be cataloged.

The devices 0220 to 0227 are online.

To delete the control units, the set of I/O paths must be offline. Refer to MVS/ESA SP V5 System Commands for more information regarding the VARY command.

The ACTIVATE command was used to activate a new IODF containing the new I/O configuration. The parameter FORCE was used because the configuration was changed in an LPAR environment. At the console you receive the messages with a description of the changes of the configuration.

8.8.3 Deleting Channel Paths
To delete channel paths, follow these steps:

1. For the channel path that you plan to delete, make sure that none of its control units and devices are in use by any application.
2. Vary all devices on the channel path offline to MVS/ESA.
3. Create a new IODF that does not define the channel path, any of the control units attached to that channel path, and any of the devices attached to these control units.
4. Configure the channel path offline.
5. Activate the new IODF.

Notes:

1. MVS/ESA verifies that the control units are not in use (that all device paths are offline) before deleting the control unit.
2. If the devices attached to the channel path to be deleted are also attached to another channel path through another control unit, just put the device paths offline and do not delete the device definitions from the IODF.

Figure 289 and Figure 290 show an example in which the active IODF includes the following definitions:

- Devices 0200-0207 (3380) are attached to two control units with control unit numbers 0200 and 0201.
- Control unit 0200 is connected to channel path 02.
- Control unit 0201 is connected to channel path 0E.

A new IODF is to be activated that does not contain channel path 0E and control unit 201. The numbers in the figures are keyed to the explanation that follows.
The active IODF was PEREYRA.IODF00. Note that if you are activating an IODF using the ACTIVATE command or the HCD dialog, the high-level qualifier (in this case PEREYRA) of the new IODF must be the same as that of the old IODF, and the IODF must be cataloged.

To delete the channel path, the set of I/O paths must be offline. Refer to MVS/ESA SP V5 System Commands for more information regarding the VARY command.

The status of the channel path to be deleted is changed to offline. Refer to MVS/ESA SP V5 System Commands for more information regarding the CONFIG command.

The ACTIVATE command was used to activate a new IODF containing the new I/O configuration. At the console you receive the messages with a description of the changes to the configuration.

8.8.4 Adding Channel Paths, Control Units, and Devices

To add channel path, control unit, and device definitions, follow these steps:

1. Create a new IODF including the channel path, control unit, and device definitions to be added to the configuration.
2. Activate the new IODF.
3. Once the configuration is activated, configure the new channel paths online.
4. Vary the new devices online.
Figure 291 shows an example in which the IODF to be activated adds the following definitions to the configuration:

- Channel path 0E.
- Control unit 0201, which is attached to channel path 0E.
- Devices 0200-0207 (3380) are attached to control unit 0201. (In the current IODF they are only attached to control unit 0200).

The numbers in the figure are keyed to the explanation that follows.

```
ACTIVATE IODF=00
:
IOSS02I I/O CONFIGURATION CHANGED 336
INVOKE = "MASTER"

NEW IODF = PEREYRA.IODF00
EDT REBUILT, NEW EDT ID = 04
CU(S) ADDED
0201.
CHPID(S) ADDED
0E.
CHPID 0E ADDED TO DEVICE(S)
0200-0207.
:
IOSS001 ACTIVATE RESULTS 344
ACTIVATE COMPLETED SUCCESSFULLY

CF CHP(0E),ONLINE
IEE754I NOT ALL PATHS BROUGHT ONLINE WITH CHP(E)
IEE502I CHP(E),ONLINE
IEE712I CONFIG PROCESSING COMPLETE
V PATH((200-207),0E),ONLINE
IEE302I PATH(200,0E) ONLINE...
IEE302I PATH(207,0E) ONLINE
:
IEE302I PATH(207,0E) ONLINE
```

8.8.5 Changing the Active EDT

In an IODF, multiple EDTs can be associated with an operating system configuration. When the system is IPLed, the operating system configuration and an EDT are selected based on the specifications of the LOADxx member (refer to MVS/ESA SP V5 Initialization and Tuning Reference for more information). A new EDT can be selected and activated dynamically using Dynamic I/O Reconfiguration Management.

The following example shows how to activate a new EDT. In this example, an IODF was activated with operating system configuration HUMBER00. There are
three EDTs associated with the OS configuration HUMBER00. The active one is EDT 02, which includes the esoterics SYSDA, SYSSQ, TAPE, and VIO.

A job was submitted to allocate a data set using the parameter UNIT=AMAA (the UNIT parameter points to an esoteric device group AMAA). The esoteric device group AMAA is not defined in the EDT 02, so the job failed.

Then a new EDT associated with the same OS configuration is activated dynamically. This new EDT includes the esoteric group AMAA. The failing job is submitted and runs successfully.

Figure 292 is the HCD panel showing the EDTs defined for HUMBER00. Select EDT 02 and the Work with esoterics action from the context menu. This displays the esoteric names for EDT 02 (shown in Figure 293). Figure 294 shows the esoterics for EDT 05 (containing AMAA).
Figure 294. Esoteric Device Groups Defined in EDT 05

Figure 295 shows EDT 02 being activated, followed by the submission of job ANAMAR, which then fails with a JCL error because the esoteric device AMAA does not exist in EDT 02. EDT 05 is then activated and the job rerun. This time, the job is successful because AMAA exists. Figure 296 and Figure 297 show the output of the job allocating UNIT=AMAA before and after the EDT change.

Figure 295. Console Messages during EDT Change and Test
Figure 296. SYSOUT of First Test Job (EDT 02 Active)

Figure 297. SYSOUT of Second Test Job (EDT 05 Active)
Chapter 9. HCD in a Sysplex Environment

As the number of interconnected systems increases, it becomes more important to have a single point-of-control for the complete configuration environment. HCD solves this requirement in several ways:

- You can define all processor and operating system configurations in one IODF. This avoids having to define the same objects, like a string of DASD devices, which are connected to several processors at several places with all the possible consistency problems. Those processors connected via CFS/CRS channel paths even have to be defined in one IODF to allow you to generate CFS control units and devices.

- Once you have completed the definitions you may want to download the IOCDSs for all processors. This can be initiated from the controlling HCD, at least for the CPCs of a S/390 microprocessor cluster. You can even initiate multiple updates in one step. For other processors in a sysplex, you have to initiate it from an HCD running on that processor.

- If you want to change some configurations dynamically within the sysplex, this can also be initiated from the controlling HCD. You can even initiate multiple activation requests in one step.

This chapter describes the role of HCD in a sysplex environment. The following topics are discussed:

- General considerations
- Different types of connections
- Planning the configuration and the activation
- Defining the configuration
- Downloading IOCDSs in a S/390 microprocessor cluster
- Accessing the IODF for IPL
- Activating a changed configuration sysplex-wide

9.1 General Considerations and Connection Examples

In HCD terms, a processor is identical to a central processor complex (CPC) of a S/390 microprocessor cluster or a central electronic complex (CEC) of an ES/9000 9021 system. A sysplex is a collection of MVS/ESA systems that cooperate, using certain hardware and software products, to process workloads. The processors that are connected in a sysplex can be:

- ES/9000 processors
- CPCs of S/390 microprocessor clusters

A sysplex can consist of one processor with several partitions defined (LPAR mode) or several processors, configured either in basic mode or in LPAR mode. Your complete installation can be configured in one sysplex or even in more than one sysplex.

In a sysplex, the processors can be connected through a:

- Coupling facility (CF)
- Channel-to-channel communication (CTC)
If your installation contains one or more S/390 microprocessor clusters, the support elements (SE) of all CPCs are connected through a token-ring LAN and controlled by one or more hardware management consoles (HMC). This is independent of whether the CPCs are connected to one sysplex or to several sysplex configurations.

The following shows you an example for a CF connection and an example for a S/390 microprocessor cluster connection.

### 9.1.1 CF Connection Example

Figure 110 shows a coupling facility configuration consisting of a:

- S/390 9672-E03 with three CPCs. Two CPCs are configured with one coupling facility partition each, the third one (E03CPC2) is configured with three partitions for MVS images. The CFS channel paths are shared between the partitions while the CFR channel paths are dedicated to the respective CF partition.
- ES/9000 9021-982. Only one partition (OS07) is assumed to participate in the sysplex. The CFS channel paths are dedicated to that partition.
- S/390 9672-E01 with one CPC, configured with three partitions for MVS images. The CFS channel paths are shared between the partitions.
- S/390 9672-E01 with one CPC, configured in basic mode.

Each MVS system is connected to both coupling facilities.

The figure also shows the CFS control units that are created by HCD when you connect a CFR channel path to a CFS channel path. Note that when a processor is connected to a coupling facility via more than one CFS channel path, HCD generates only one CFS control unit and connects all CFS channels to that control unit (see CU7).

HCD is used to configure the:

- Processors
- Partitions
- CFS and CFR channel paths

HCD is also used to connect the CF channel paths, which means to configure the CFS control units and devices.

HCD running in one of the MVS images allows you to dynamically change the hardware or software configurations of all CPCs and MVS systems configured in the sysplex.
9.1.2 S/390 Microprocessor Cluster Connection Example

Figure 299 shows the same configuration as Figure 110 on page 86. The support elements (SE) of the 9672 processors are connected to an S/390 microprocessor cluster via a token-ring LAN. Two HMCs are configured in the LAN, one of them for backup purposes. Note that the 9021-982 does not participate in the LAN connection. That means HCD running on a 9672 CPC cannot download an IOCDS to the hardware disk of the 9021-982. This has to be done using that HCD that runs locally on that processor.

HCD running in one of the MVS images of the S/390 microprocessor cluster uses the token-ring LAN to query the SNA addresses of the SEs from the HMC and to map them with the processors defined in your work IODF. After having built a production IODF, you use HCD to remotely:

- Download and manage IOCDSs
- View and update IPL address and LOAD parameter values
9.2 Planning Task

When you plan the physical connections keep in mind that:

- You have to define later on the configurations using HCD.
- You need access to one or more IODFs from all MVS images.
- You want to use the HCD functions for downloading IOCDSs and for activating a configuration change sysplex-wide.

Try to plan the configurations as symmetrically as possible to make the definition easier and to keep control over the configuration. For example use the same channel path from all processors to attach to a specific control unit. That allows you to use the repeat processor action and to use group actions from HCD.

9.2.1 Planning the Configuration Definition

As a configuration can be considered as being hierarchical, you might tend to first define all processors then the processors dependent objects like partitions and channel paths, and finally the control units with their attached devices. But this approach might result in a lot of duplicate work and might, therefore, be error prone and cumbersome.

Many parts of the processor definitions for a sysplex environment are similar or even identical due to the symmetric configurations of the sysplex. Therefore the following is recommended:

1. Define the operating systems and the switches.
2. Define one processor with all objects and connections that are common or similar (easy to be changed)
   - Partitions
   - Channels paths
   - CTC connections
   - Shared control units
   - Shared devices

3. Make a copy of the processor definition (repeat).

4. Change what is different, for example partition names or channel path IDs.

5. Add what is unique to each processor definition, for example port range used to connect the channel paths, or CFR/CFS connections.

Note: Processor ID and partition number have to be specified in the PARMLIB member IEASYMxx for the respective system.

If several processors in your configuration share a set of control units and devices, and you have defined the control units and devices and connected them to the first processor, the repeat processor action makes a copy of the processor with its partitions and channel paths and connects the new processor to the existing set of control units and devices.

9.2.1.1 One IODF versus Multiple IODFs
When HCD administrators come together, one of the most common questions is: “Should we configure the complete environment in one IODF or is it better to keep the different configurations in separate IODFs?” Although it depends on your actual environment, it is recommended to keep all configuration definitions within one IODF:

- The IODF will contain more data, but HCD has now a powerful filter capability on every object list. For example, limit the control unit list to all control units not connected to a processor, or list all ports of an ESCD that are free. Use the imbedded functions to limit the list of objects, for example all devices that are attached to a control unit. Go to the control unit list, select a control unit and the Work with attached devices action (or action code 5).

- It is required for multiple updates of IOCDSs in an S/390 microprocessor cluster and recommended for sysplex-wide activate that the complete configuration be contained in one IODF.

- Multiple CPCs connected through CFR and CFS channel paths must be defined in the same IODF. Otherwise you cannot connect the channel paths.

- Multiple CPCs configured in a sysplex probably share many of the I/O devices, like shared DASD devices, shared tapes or ESCDs. Using separate IODFs you have to define the same object several times, and if anything changes you have to change it in several places. Let’s consider CTC connections between multiple CPCs through one or more ESCDs. It is hard to keep track of which channel path is connected to which port, unless you have defined it in one IODF. Use the graphical display facility to get a clear view of your configuration.

- Use the latest version of HCD to define your configuration (currently HCD 5.2). This HCD version allows you to define the configuration for all CPCs and all MVS systems configured in the sysplex.

- Once you detect that your original decision (keep the definitions in one or in several IODFs) should be revised, HCD allows you to copy a complete
configuration from one IODF to another IODF. For example, you can copy a processor definition with all its connected control units and devices to a new IODF. Or you can merge your configurations originally defined in separate IODFs together into one IODF. You may accomplish this using the repeat action which allows you to designate a target IODF.

Exception: If you plan to run a processor of your sysplex alternatively in basic mode or in LPAR mode, do not define both processor configurations in one IODF. From an HCD point of view, you have two processor definitions, but you cannot connect the CFS channel paths of both processors to the same CFR channel path. One of the two CF connections would be incomplete.

Create a copy of the IODF using the same high level qualifier (HLQ). Configure the affected processor in basic mode in one IODF, and in LPAR mode in the other IODF. Define for both processors the proper CFS/CFR connections and CTC connections. For details, see 4.12, “Changing the Configuration from Basic to LPAR” on page 140.

9.2.2 Planning for Sysplex-Wide IODF Access

For details about IODF release level compatibility refer to Hardware Configuration Definition: User’s Guide. Use the latest version of HCD to define your configuration:

- HCD 5.1 and HCD 5.2 IODFs are fully compatible.

- An IODF in HCD 5.2 format can be used by MVS 5.1 and MVS 4.3 for IPL and dynamic activate. If HCD 5.1 is installed on MVS 4.3, dynamic activate can be initiated using the HCD dialog or the ACTIVATE command. If HCD R.3 is installed on MVS 4.3, initiation of dynamic activate is restricted to the ACTIVATE command (only the command can read the higher level IODF format).

- The safest way is to define exactly what is supported by the respective MVS system. If you connect a 4-digit device to an operating system definition that is used later on to IPL an MVS 4.3 system or to dynamically change the configuration of an MVS 4.3 system, these devices are ignored. If you try to activate a processor definition on MVS 4.3 and this definition contains CFS/CFR channel paths, the activation request will be rejected. Of course other processor definitions in the same IODF may contain coupling facility channels paths, but the one you plan to activate should contain only what is supported by the respective MVS system.

- Some installations have defined one operating system configuration connecting all devices to it that are available in the sysplex. They use that super configuration to IPL all the MVS systems. Those devices that cannot be accessed during IPL are set offline. But keep in mind the different support available on different levels of MVS systems as described above. It might be safer to make copies of the operating system definition and adjust them to the actual MVS system. Later on a device can be easily added or a device parameter changed using the dynamic activate function.

- If you cannot share your IODF (5.2 format) between all MVS systems running in the sysplex for any reason, export the production IODF to those systems and import them there using the local HCD. Even HCD R.3 running on MVS 4.3 can import a 5.2 formatted IODF, and MVS 4.3 can use it for IPL.

- A common question is how and where to catalog the IODF. An IODF need not be cataloged if used for IPL, but it has to be cataloged if used for
dynamic activate or used by the HCD dialog. It is recommended to catalog the IODF in a user catalog and connect that user catalog to every master catalog. Keep the backup IODF together with the SYSn.IPLPARM data set on a different volume with a different HLQ, and have them cataloged to a user catalog residing on that volume.

9.2.3 Planning for Download IOCDSs in a S/390 Microprocessor Cluster

Make sure that the hardware setup is complete. See Figure 298.

- Connect all SEs including an HMC to the token-ring LAN.
- Configure all CPCs at the Master HMC for which you plan to download the IOCDS.

One MVS system must be available together with the HCD that you can use to configure the complete environment in an IODF. As only one MVS system and only one HCD is required to initiate IOCDS downloading for all SEs within an S/390 microprocessor cluster, it is recommended to:

1. Start from this system.
2. Configure all other CPCs with their partitions in one IODF.
3. Download the IOCDSs to all SEs.
4. POR the CPCs.
5. IPL the other MVS systems.

9.2.4 Planning for a Sysplex-Wide Activate

MVS provides a platform of basic multisystem services in a sysplex that enhances the availability and improves managing the complexity of a multisystem environment. One of the services is the sysplex-wide activate. HCD is used as a single point of control to initiate dynamic activate for one or more systems configured in the same sysplex, that means, configured in the sysplex couple data set.

Consider the following when you plan to activate your configuration changes sysplex-wide:

- Partitions and CFR channel paths cannot be added or deleted dynamically. They are made active through a POR. You should take this into consideration when you plan your environment.
- Only those systems that are configured in the sysplex couple data set can be configured dynamically. That means the MVS systems have to be up and running in order to be configured and to permit a software change.
- The sysplex-wide activate function of HCD initiates the execution of the ACTIVATE command on every MVS system selected. That means, every MVS system must be in a proper state related to dynamic I/O reconfiguration. At least software changes must be allowed by the system. To verify the current state, select from every HCD the options Activate or process configuration data and then View active configuration. HCD displays the currently active IODF, the HSA token and the activation scope.
- If your sysplex contains an MVS 4.3 system, it cannot be reconfigured dynamically using the sysplex-wide activate function. You have to use HCD running on that system or the ACTIVATE command on that system to initiate the dynamic activation.
As for local dynamic activation requests, the high level qualifiers (HLQ) of the currently active IODFs on all systems have to be identical to the HLQ of the IODF that contains the configuration changes. It is recommended to use the same HLQ for all production IODFs in use and to share one common IODF wherever possible.

**Exception:** It is recommended earlier in this book to use a different HLQ for the backup IODF and to place it on a different volume in order to be able to restart the systems should your IPL volume become unusable. This is still valid. If you share one IODF and this IODF volume becomes unusable, restart your systems using the backup IODF, and all HLQs should be synchronized again.

### 9.3 Definition Task

1. **Add a new processor with SNA address to the processor list:**
   When you define a new processor of an S/390 microprocessor cluster, you can specify the SNA address of the SE of the new CPC. Use Prompt on the Add Processor panel for the SNA address. HCD requests the SNA addresses for all SEs configured at the HMC and displays them. See Figure 300. Select the one belonging to the processor you are defining.

   ![Available SNA Addresses](image)

   **Possible problems:**
   - “No prompt available” message displayed:
     - The HMC does not respond. Determine if the HMC is up and running. Check the token-ring cabling to the local SE.
   - The SNA address you are looking for is not contained in the list of SNA addresses:
     - The corresponding CPC is currently not configured in the HMC.

   In Figure 301 the SNA address is updated with that one you have selected.
Update a processor definition with SNA address:

If the processor has already been defined in a previous step, for example, you made a copy of an already defined processor, and you want to update the SNA address, use the F20 key to move the work area to the right of the Processor List panel to display the fields for the SNA address. Place the cursor at the SNA address field and press F4 to prompt for the SNA address. HCD displays the SNA addresses. Select the one belonging to the processor you are defining. The SNA address field is now updated with the one you have selected. See Figure 302.

Note: The SNA address of processor P982A is empty. This processor is not part of the S/390 microprocessor cluster.

Note: You might want to create two processor definitions with different processor IDs for the same CPC, for example, one for the processor in basic mode and one for the processor in LPAR mode. In that case, specify the same SNA address for both processor definitions. Later on you can specify for which processor definition you want to build the IOCDS.

2. Define a partition for coupling facility usage:

When you define a partition, specify either usage type OS or CF depending on what you plan to use the partition for. The usage type is only required for
HCD’s validation services to guarantee valid definitions. It is not downloaded with the IOCDS and not required by the channel subsystem. Before you activate a partition at the hardware console or at the HMC, you define whether this partition will be used to run an operating system or a coupling facility. See 4.5, “Defining a Coupling Facility Configuration” on page 84 for more information.

Specify the same processor ID and partition name in the IEASYMxx member located in SYS1.PARMLIB for the respective sysplex system.

```bash
SYSDEF HWNAME(E03CPC2) <=====
LPARNAME(OS02) <=====
SYSPARM(XX)
SYSNAME(SC55) <=====
SYMDEF(&CMDLIST1='XX,00')
SYMDEF(&LOGREC1A='SYS1.')
SYMDEF(&LOGREC2A=&SYSNAME.')
SYMDEF(&LOGREC3A='LOGREC')
SYMDEF(&SSNLST01='XX')
```

3. **Define CFR and CFS channel paths and their connection:**

Defining CFR and CFS channel paths is done the same way as defining any other channel path. CFR channel paths can only be defined as DED and can only have a CF partition in their access list, while CFS channel paths can be defined as DED, REC or SHR and can only have OS partitions in their access and candidate list.

Only CFS channel paths can attach a control unit (type CFS). When you connect a CFS channel path to a CFR channel path using the HCD dialog, HCD creates a CFS control unit and a pair of CFS devices. You can view the control unit and the devices but not change them. You don’t need to connect the CFS devices to an operating system definition as you do with other devices. See 4.5, “Defining a Coupling Facility Configuration” on page 84 for more information.

4. **Define CTC connections:**

CTC connections become an important part of the definition task for a sysplex environment. You may use SCTC devices (or BCTC devices) for communicating between each of the systems. You may also decide to use SCTC devices for sysplex signaling with path-in and path-out devices and with primary and alternate paths instead of using the coupling facility connections for sysplex signaling. HCD performs only a formal validation to fulfill the channel subsystem rules. It does not prevent invalid connections like circular paths. Therefore it is strongly recommended to use a definition scheme to control your definitions. See Chapter 5, “ESCON CTC Definitions” on page 145 for more information.

For a device attached to a shared channel path, define an explicit device candidate list to control the access of a partition to that device.

5. **Add a shared control unit:**

If you add a new control unit and you want to connect it to several processors, you have to set the CU/processor attributes for every processor. That might become quite cumbersome, unless you use the Group connect action as follows:

- Define the control unit.
• On the Select Processor / Control Unit panel select all processors to which you want to connect the control unit and the Group connect action as show in Figure 303.

![Select Processor / Control Unit Panel](image)

Figure 303. Context Menu of the Select Processor / Control Unit Panel

• Specify the required data on the subsequent Add Control Unit panel, as shown in Figure 304. An asterisk (*) for Processor ID indicates that the action is performed against all selected processors. Note that the control unit is being attached to the same set of channel paths for every processor.

![Add Control Unit Panel](image)

Figure 304. Add Control Unit Attachment Parameters

### 9.4 Operational Tasks

Once the SNA addresses for all processors within the S/390 microprocessor cluster have been defined as well as the coupling facility definitions for all processors in the sysplex, you create the production IODF. A number of validations are performed and messages are returned if anything is not properly defined. You should resolve the warning messages unless you fully understand the reason for them. This is also the time when the processor tokens are built that are used later on to synchronize the IODF and the IOCDS.

For the following operational tasks, you need the proper RACF authority. For details, see Chapter 11, “HCD Customization” on page 269.
9.4.1 Build S/390 Microprocessor Cluster IOCDSs

You can build (download) the IOCDS for all processors within the S/390 microprocessor cluster from one HCD and one IODF. HCD builds the IOCDS and forwards it to the respective SE within the token-ring LAN using the SNA address you have specified. Perform the following steps:

1. From the primary task selection panel, select **Activate or process configuration data**, and from the resulting panel, select **Build and manage S/390 microprocessor IOCDSs and IPL attributes**. This panel shows all CPCs configured in an S/390 microprocessor cluster. See Figure 305. They are identified by the SNA address of their SE. If you have defined several processor IDs with the same SNA address, the first processor ID (in alphabetic order) is displayed followed by two dots (..). If you want to apply an action on another processor, select the entry with the dots and the **Select other processor configuration** action from the context menu (or action code p).

2. On the S/390 Microprocessor Cluster List panel, select the CPCs for which you want to build and manage the IOCDSs and the **Work with IOCDSs** action from the context menu (or action code s). HCD displays the IOCDS List panel. See Figure 306. All applicable IOCDSs of the selected CPCs are arranged in ascending order by IOCDS IDs. This enables you to apply the IOCDS functions as group actions against IOCDSs for all selected processors. For example, in order to update IOCDS A1 for all processors in the S/390 microprocessor cluster, select all A1 IOCDSs, as shown in Figure 306.

The **Type** field contains only LPAR because all processors are configured in LPAR mode. It would contain ESA390 if the processor is configured in basic mode.

---

**Figure 305. S/390 Microprocessor Cluster List**

Possible problems:

- A disabled sign (#) is displayed in the action entry field and the processor field is empty:
  - The affected SNA address is not defined for any processor in the IODF you are currently accessing.

- A disabled sign (#) is displayed in the action entry field and the CPC type and model fields as well as the Processor ID field are empty:
  - The SE with that SNA address did not respond. Verify the token-ring cabling to that SE. Verify if somebody has logged on locally to the SE.

---

**Figure 306. S/390 Microprocessor Cluster IOCDS List**

The Type field contains only LPAR because all processors are configured in LPAR mode. It would contain ESA390 if the processor is configured in basic mode.
The Status field indicates the status of the IOCDS:

- POR (to be used at next POR)
- Alternate (not to be used at next POR)

The Token Match-IOCDS/HSA field indicates whether the hardware configuration tokens stored in the IOCDS and in the HSA match. If Yes is shown, it means that the IOCDS has been built by using HCD, and that either this IOCDS was used for the last POR, or the matching configuration has been activated dynamically. It might be necessary to update the IOCDS.

The Token Match-IOCDS/Proc. field indicates whether the hardware configuration token stored in the IOCDS matches the processor token in the IODF that is currently accessed by the HCD dialog. If Yes is shown, it means that the processor configuration has not changed.

The Write Protect field indicates the write protect status of the IOCDS:

- Yes-POR (write protected and used for current POR)
- Yes (write protected, not shown in Figure 306)
- No (not write protected)

Press F20 to move the work area to the right to see information such as date and time of the last IOCDS update, and the hardware configuration token stored in the IOCDS.

<table>
<thead>
<tr>
<th>IOCDS List</th>
<th>Row 1 of 16</th>
<th>More: &gt;</th>
</tr>
</thead>
</table>

Select one or a group of IOCDSs, then press Enter.

<table>
<thead>
<tr>
<th>IOCDS Name Type</th>
<th>Status</th>
<th>IOCDS/HSA</th>
<th>IOCDS/Proc. Protect</th>
</tr>
</thead>
<tbody>
<tr>
<td>A0.E01CPCL IODF54 LPAR POR</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes-POR</td>
</tr>
<tr>
<td>A0.E03CPC1 IODF54 LPAR Alternate No</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>A0.E03CPC2 IODF54 LPAR POR</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes-POR</td>
</tr>
<tr>
<td>A0.E03CPC3 IODF54 LPAR Alternate No</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>A1.E01CPCL IODF51 LPAR Alternate No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>A1.E03CPC1 IODF47 LPAR Alternate Yes</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>A1.E03CPC2 IODF51 LPAR Alternate No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>A1.E03CPC3 IODF47 LPAR Alternate No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>A2.E01CPCL IODF52 LPAR Alternate No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>A2.E03CPC1 IODF52 LPAR POR</td>
<td>No</td>
<td>No</td>
<td>Yes-POR</td>
</tr>
<tr>
<td>A2.E03CPC2 IODF52 LPAR Alternate No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>A2.E03CPC3 IODF52 LPAR POR</td>
<td>Yes</td>
<td>No</td>
<td>Yes-POR</td>
</tr>
</tbody>
</table>

Figure 306. IOCDS List of a S/390 Microprocessor Cluster

On this panel you can select three actions from the context menu:

- **Update IOCDS** allows you to download IOCDSs to any SE within the S/390 microprocessor cluster.

- **Switch IOCDS** allows you to mark an IOCDS as the one used for the next POR. Press Enter to refresh the IOCDS list.

- **Enable/Disable write protection** allows you to change the current write protect status. Press Enter to refresh the IOCDS list.

3. Select an IOCDS or a group of IOCDSs and the Update IOCDS action from the context menu (or action code}. HCD displays the Build IOCDSs panel. See Figure 307.

On this panel you can specify whether you want to make this IODF the active one for the next POR by specifying Yes in the Switch IOCDS field.
Build IOCDSs

Specify or revise the following values.

IODF name . . . . . . . . . : 'SYS4.IODF55'

Title1.
Title2 : SYS4.IODF55 – 95-03-13 09:56

IOCDS Switch IOCDS
A1.E01CPCL Yes
A1.E03CPC1 No
A1.E03CPC2 Yes
A1.E03CPC3 No

Figure 307. List of IOCDSs to Be Built

4. After pressing Enter on the Build IOCDSs panel, the Job Statement Information panel is displayed. Specify the information for the batch job that HCD generates to build the IOCDSs. The load libraries that contain HCD and IZPIOCP (normally SYS1.LINKLIB) have to be accessible.

9.4.2 Manage S/390 Microprocessor Cluster IPL Attributes

In order to control the IPL addresses and the IPL parameters, you as the system programmer for the complete S/390 microprocessor cluster can set and update these IPL attributes using HCD. They are stored at the HMC in a different area than the ones you have entered manually. To make them active, select on the LOAD profile that is used for IPL Use dynamically changed IPL address and Use dynamically changed IPL parameter.

Note: You cannot display these IPL attributes at the HMC. Use HCD to display and to update them.

Perform the following steps:

1. On the primary task selection panel, select Activate or process configuration data, and from the resulting panel, select Build and manage S/390 microprocessor IOCDSs and IPL attributes.

2. On the S/390 Microprocessor Cluster List panel (see Figure 305), select the CPCs for which you want to view, set or update the IPL attributes and the Work with IPL attributes action from the context menu (or action code \textbf{F}). HCD displays the IPL Attribute List panel, as shown in Figure 308.

The IPL Attribute List panel displays the IPL address and the IPL parameters for all selected processors and their partitions that are obtained from the support element of the associated CPCs.
Figure 308. IPL Attribute List Panel

To view the current IPL attributes, press F20 to move the work area to the right.

3. Update the IPL device number and the IPL parameters as required and press Enter. They are displayed as Next IPLADDR and Next IPLPARM values until the next IPL. Then they are displayed as Last IPLADDR and Last IPLPARM values.

9.4.3 Activate Configuration Changes Sysplex-Wide

The starting point for sysplex-wide activation requests is the Active Sysplex Member List, as shown in Figure 309. Starting from the primary task selection panel where you have specified the production IODF to be activated, select Activate or process configuration data, and from the next panel select Activate configuration sysplex-wide.

You can see the system names, and the processor IDs and partition names associated with the system names. You can also see the IODF to be activated, the name of the sysplex, the active IODFs, the configuration IDs and EDT IDs used for IPL, and the Activate status, which is empty initially. All processors are configured in LPAR mode; therefore, the Partition name column contains values for all entries.

All this information is available in the sysplex couple data set together with the hardware configuration token stored in the HSA of every CPC. HCD requests the information from the sysplex couple data set and displays it in a formatted list as shown in Figure 309.

HCD cannot associate a processor ID to a system; which means the entry in the Processor ID column is empty, if:

- The processor ID and/or the partition name received from the sysplex couple data set are not defined in the IODF to be activated.
- The MVS system runs as a VM guest.

This doesn’t mean that you cannot initiate an activation request for that system. It means that you have to specify the correct processor ID later on by yourself, as required. Prompt support will be available.

The system name representing an MVS 4.3 system in the sysplex would be disabled for any action. That means any activation requests have to be initiated locally on that system.
The Active Sysplex Member list will be refreshed whenever you press Enter. If a system joins the sysplex, it will be added to the list in alphabetical order. If a system leaves the sysplex, it will be deleted from the list. Also if you have initiated an activation request for one or more systems, the Activate Status will change to In progress and finally to Messages once the activation request has entered this state and you have refreshed the list.

<table>
<thead>
<tr>
<th>System</th>
<th>Processor Partition</th>
<th>Active Config.</th>
<th>EDT</th>
<th>Activate</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC47</td>
<td>SY54.IODF55</td>
<td>L06RMVS1</td>
<td>01</td>
<td></td>
</tr>
<tr>
<td>SC48</td>
<td>E01CPB</td>
<td>SY54.IODF09</td>
<td>MVS48</td>
<td>01</td>
</tr>
<tr>
<td>SC49</td>
<td>E01CPCL</td>
<td>SY56.IODF04</td>
<td>L06RMVS1</td>
<td>01</td>
</tr>
<tr>
<td>SC50</td>
<td>E03CP2</td>
<td>SY56.IODF04</td>
<td>L06RMVS1</td>
<td>01</td>
</tr>
<tr>
<td>SC52</td>
<td>E01CPCL</td>
<td>SY56.IODF04</td>
<td>L06RMVS1</td>
<td>01</td>
</tr>
<tr>
<td>SC53</td>
<td>E01CPCL</td>
<td>SY56.IODF04</td>
<td>L06RMVS1</td>
<td>01</td>
</tr>
<tr>
<td>SC54</td>
<td>E03CP2</td>
<td>SY56.IODF04</td>
<td>L06RMVS1</td>
<td>01</td>
</tr>
<tr>
<td>SC55</td>
<td>E03CP2</td>
<td>SY56.IODF04</td>
<td>L06RMVS1</td>
<td>01</td>
</tr>
</tbody>
</table>

Figure 309. Activate Sysplex Member List - Part 1

Press F20 to move the work area to the right to see more information for processors configured in basic mode, such as the currently active hardware configuration token stored in the HSA, and whether the hardware configuration token stored in the HSA matches the processor token stored in the IODF. This information is not shown for processors running in LPAR mode because the information received from the sysplex data set might not reflect the actual state. See Figure 310.

Note: Only processor ID and WWUV (world-wide-unique-value) are compared. For more information see 8.7.6, “Details about Tokens” on page 234.
Move the work area again to the right to see the free space in the HSA for processors configured in basic mode. For processors configured in LPAR mode, select the system name and the **View the configuration status** action to receive the equivalent information.

<table>
<thead>
<tr>
<th>System</th>
<th>Processor</th>
<th>Physical CUs</th>
<th>Subchannels</th>
<th>Logical CUs</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC47</td>
<td>E01CPB</td>
<td>19</td>
<td>175</td>
<td>18</td>
</tr>
<tr>
<td>SC48</td>
<td>E01CPCL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC49</td>
<td>E01CPCL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC50</td>
<td>E03CPCL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC52</td>
<td>E01CPCL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC53</td>
<td>E01CPCL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC54</td>
<td>E03CPCL</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SC55</td>
<td>E03CPCL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 311. Activate Sysplex Member List - Part 3**

Starting from the Active Sysplex Member list, you can initiate for one or more systems concurrently:

- **Activate a software configuration only**, for example to synchronize the hardware and software configurations or to indicate a device as dynamic or to move the UCB of a device above 16MB.

- **Activate a hardware and software configuration** if your configuration has changed.

- **Resume activation of the target configuration** or **Reset the source configuration**. If messages returned indicate an unsuccessful activation request and indicate also that a recovery action is required to reset the system in a proper state, select the affected system and the **View configuration status** action from the context menu (or action code /SF590000). This provides you with the information about which recovery action is adequate: either reset the original configuration or force to activate the changed configuration.

- **Switch the IOCDS for the next POR**, for example if you have activated a new configuration, have tested it and you want to use this configuration for subsequent PORs.

- **View or delete the messages** returned from an activate request. The messages remain available until you delete them explicitly or you initiate a new activation request for the corresponding system.

- **View the configuration status** provides you with the same information as it is displayed if you enter the command D IOS,CONFIG(ALL) at the system console.
Assume a string of DASD devices has been installed and made available for shared usage by all MVS systems running on processors E01CPCL and E03CPC2. Perform as follows:

1. Step 1: Activate software configuration only for systems SC52, SC53, SC54 and SC55 with hardware validation to insure that the subsequent hardware activation can be performed. These are all but one partition from both processors. After this step, hardware and software are no longer synchronized.

2. Step 2: Activate software and hardware configuration for systems SC49 and SC50. These are the remaining two partitions from both processors. After both steps have been performed, all systems will be updated with the configuration changes, and the tokens are synchronized again.

9.4.4 Step 1: Activate Software Configuration Only

Select systems SC52, SC53, SC54 and SC55 from the Active Sysplex Member list and the **Activate software configuration only** action from the context menu (or action code [/SF590000]). The Activate Software Configuration Only panel is displayed as shown in Figure 312.

All systems you have selected are shown together with the associated processor IDs. Remember we also want to validate the hardware changes; therefore the processor IDs are required. If the Processor ID field is empty, prompt for the processor IDs and select the actual one. If the Config. ID and the EDT ID fields are empty, it is an indication that the ID of the currently active configuration is not defined in the IODF to be activated. Prompt for the new ID. Updating the processor ID, the Config. ID or the EDT ID fields might be required if your IODF to be activated contains IDs different from those displayed as default IDs.

**Note:** The IDs may be different in the currently active IODF and in the IODF to be activated, but make sure, the HLQ of the two IODFs is identical.

```
<table>
<thead>
<tr>
<th>System</th>
<th>Processor</th>
<th>Partition</th>
<th>Config.</th>
<th>EDT Valid.</th>
<th>Test</th>
<th>Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>SC52</td>
<td>E01CPCL</td>
<td>OS05</td>
<td>L06RMVS1 01</td>
<td>Yes</td>
<td>No</td>
<td>SY56.IODF04</td>
</tr>
<tr>
<td>SC53</td>
<td>E01CPCL</td>
<td>OS06</td>
<td>L06RMVS1 01</td>
<td>Yes</td>
<td>No</td>
<td>SY56.IODF04</td>
</tr>
<tr>
<td>SC54</td>
<td>E03CPC2</td>
<td>OS01</td>
<td>L06RMVS1 01</td>
<td>Yes</td>
<td>No</td>
<td>SY56.IODF04</td>
</tr>
<tr>
<td>SC55</td>
<td>E03CPC2</td>
<td>OS02</td>
<td>L06RMVS1 01</td>
<td>Yes</td>
<td>No</td>
<td>SY56.IODF04</td>
</tr>
</tbody>
</table>
```

Figure 312. Activate Software Configuration Only Panel

After you have finished updating the panel, press Enter. The Active Sysplex Member list will be displayed again, but now the Active Status column shows the status **In progress**. If you refresh the list occasionally, you can see that one system after the other completes the activation request. This is indicated by the status **Messages**.
Select a system and the **View activate messages** action from the context menu (or action code /SF590000). The messages returned from that system as the result of the activation request will be displayed as shown in Figure 313.

![Figure 313. Message Panel with ACTIVATE Messages](image)

**Note:** HCD initiates the execution of the ACTIVATE command on the local or remote system. The messages returned are a response to that command. If you are not familiar with the keywords of the command, refer to *MVS/ESA SP V5 System Commands*. For example, if the message contains KEYWORD PROC INVALID, it means that the processor ID must not be specified.

### 9.4.5 Step 2: Activate Software and Hardware Configuration

Select systems SC49 and SC50 from the Active Sysplex Member list and the **Activate software and hardware configuration** action from the context menu (or action code /SF590000). The Activate Hardware And Software Configuration panel is displayed as shown in Figure 314.

Both systems you have selected are shown together with the associated processor IDs. Update the panel as required. If you plan to delete a device for a specific system, specify Yes in the **FORCE DEVICE** field of that system. If you plan to remove a partition from the access or candidate list of a channel path belonging to a specific system, specify Yes in the **FORCE CANDID.** field of that system.

![Figure 314. Activate Hardware and Software Configuration Panel](image)
Verify the messages returned from the affected systems to insure that the activation requests have been successfully completed. After that you now delete all messages.

**Note:** Review the Active Sysplex Member List: At the minimum, the *Active IODF* fields have changed for the affected systems and now contain the name of the IODF to be activated. If you have defined different processor IDs, configuration IDs or EDT IDs and you have activated their configurations, these fields also have been changed.
Chapter 10. HCD and ESCON Manager Relationship

This section discusses ESCON concepts in relation to HCD, and specifically the inter-relationship between HCD and the ESCON manager (ESCM).

10.1 ESCON Concepts

The dynamic I/O reconfiguration capability to install hardware non-disruptively is significantly enhanced by ESCON. For those unfamiliar with ESCON, this section briefly describes the architecture and some of its benefits.

10.1.1 ESCON Architecture

The ESCON architecture is essentially a point-to-point architecture. The ESCON channel implementation uses fiber optic technology, ideally suited for point-to-point operation over long distances at high speed. Optical technology is less susceptible to error caused by electrical noise. Optics also have very low radiation properties, which make them more secure than electrical cables.

The point-to-point architecture lets you route data using dynamic switches. These switches can be used to connect multiple channels to the same device (control unit), or multiple devices (control units) on the same channel. These switches are called ESCON Directors (ESCD). The directors can be controlled and managed from host-based functions such as the ESCON Manager (ESCM) and HCD. Host systems and the directors communicate using the channel connections “switched” by the director.

ESCON provides bidirectional serial bit transmission, in which the communication protocol is implemented through sequences of special characters and through formatted frames of characters. A sequence is a set of characters in a predefined order used to signal specific states or transition to states, such as a port entering offline state. The ESCON I/O interface defines two types of frames, one to control the link and associated elements, and another to control device operation.

Each frame contains addressing information that uniquely identifies the recipient and the originator. The address is made up of the following elements:

- Link value associated with the ESCD port number
- Control unit image (CUADD value)
- Device unit address

The ESCON I/O interface allows physical control units to define multiple images that can be addressed separately. These control unit images can control a shared or independent set of devices. The control unit image can be considered to operate independently from all other control unit images, for example, each can establish communication with its own channels.

As stated above, the transmission medium for the ESCON I/O interface is a fiber optic cable. Physically, it is a pair of optical fibers that provide two dedicated unidirectional serial bit transmission lines. Information in a single optical fiber always flows in the same direction. Thus, one optical fiber is used to receive data while the other is used to transmit data.
The ESCON implementation in the channel subsystems of IBM ES/9000 processors:

- Communicates from the processors to peripherals
- Supports multiple path connections to peripherals
- Provides processor-to-processor communication using serial channel-to-channel connections
- Provides routing information
- Detects media connection and disruption
- Identifies and verifies paths
- Assists in error recovery
- Supports logical channels
- Provides a logical path

10.1.2 ESCON Director (Switch)

To implement the new switching functions of ESCON, a new class of devices was introduced. These devices, called ESCON directors, connect channels and control units only for the duration of an I/O operation. They are non-blocking, can switch millions of connections per second, and are the centerpiece of the ESCON topology. Apart from dynamic switching, the ESCON directors can also be used for static switching of "single user" control units among different system images.

Directors switch connections between ports under the direction of the destination instructions provided by the channel subsystem and the attached ESCON control units.

For non-ESCON control units without the capability of maintaining source and destination information, a director can provide a static switch function. This is used to emulate a parallel channel using ESCON converters to exploit the ESCON fiber technology.

In order to store configurations and handle errors, for example, the director has an integrated control unit, addressed like any other control unit. The channel subsystem can communicate with the director just like any other control unit in the ESCON subsystem. The director dynamically switches I/O requests for itself to its own internal port.

The director consists of multiple bidirectional ports to which channels and control units may be attached. The ports are capable of any-to-any connection, but the installation may restrict this access by:

- Blocking ports (allowing no access at all)
- Prohibiting port-to-port connections
- Dedicating port-to-port connections (mainly for control units that do not support the ESCON architecture)
- Allowing connections (opposite of prohibiting)

The port configuration is held in a switch port matrix in the ESCON director. The port matrix can be read and written from an attached host using the ESCON manager. An initial port matrix is held on the disk of a PS/2 directly attached to the director; however, this disk data is not directly addressable by the ESCON manager and hence cannot be changed remotely. HCD uses the ESCON manager to communicate with ESCON directors, and can effect changes only through the ESCON manager.
10.1.3 ESCON Manager

The ESCON Manager (ESCM) is used to maintain and manage the dynamic switch configurations in ESCON Directors (switches). The main functions of ESCM are:

- Provide operator interface-director configuration management.
- Communication with directors using the channel subsystem (directors also have a PC console local end-user interface).
- Serialization of configuration changes across multiple systems sharing access through a director.
- Backout of changes when any participating system detects an inability to implement the requested change.
- Provide dialog interface using ISPF to enable the maintenance of switch configuration.
- Provide peer-to-peer programming interface to other hardware management components, such as HCD.

The ESCON Manager also provides a graphical user interface through a programmable workstation. This interface provides a graphical representation of the switch configuration that allows operators to view and manipulate the port connections.

10.2 HCD and ESCM Relationship

HCD and ESCM work together to maintain the configuration of the hardware of the system. They have specific roles.

The ESCON Manager is responsible for the integrity of switch changes:

- Checks for final path removal on attached systems
- Seeks concurrence from all hosts before switch change
- Retrieves switch port matrix information for manipulation and change implementation
- Writes changes back to the switches
- Instructs switches to change the port matrix status
- Backs out changes, should unrecoverable errors occur

HCD is used to define the director to the hardware and the operating system software of the attached systems. HCD can be used to:

- Maintain the definition of the switch
- Maintain a view of the port matrix
- Migrate switch configurations directly from the directors into HCD using ESCM, or from ESCM saved ISPF table
- Dynamically update the switch configuration matrix in each director

HCD is also used to check the definition of switch port usage and connection information for all devices and channels connected by each director. HCD checks that:

- Port connections are not duplicated
- Devices are specified through a valid switch
- Channel connections do not conflict
- The path is complete

Changing the switch port matrix of a director is not a hardware configuration change as far as the processor is concerned. Hence, HCD does not switch the
active production IODF when a change to a switch port matrix is requested. Because of this, the IODF used to change the director port matrix does not have to contain the complete configuration.

Switch port matrixes can be migrated from either the active switches or from ESCON Manager saved ISPF tables. Migration is covered in Chapter 6, “Migration” on page 181.

Switch data can be stored in several places:

- The active switch data is in the switch itself.
- The switch may have a copy of the active configuration on its support console disks.
- The ESCON Manager may have a copy of the active configuration in its working storage, being worked on as an ISPF table.
- The ESCON Manager may have saved copies of possible configurations in ISPF tables.
- HCD may have configurations stored in the active production IODF.
- HCD may have configurations stored in other production IODFs.
- HCD may have configurations stored in work IODFs.

We ignore work IODFs and ESCM storage as they are volatile and therefore only transient copies of the switch configurations. The switch itself, however, containing the currently active switch matrix, loads only the installation default configuration placed on its disks at power-on time. This power-on configuration cannot be downloaded using ESCM.

This leaves (from the previous list):

- The tables saved by ESCM
- The current production IODF maintained by HCD
- The not currently active IODF maintained by HCD

Since ESCM is not aware of the physical hardware that connects to the switch, we prefer the HCD solution for storing switch data. However, the ESCM facility is still very useful in a test environment where the installation does not want to keep up-levelling the active production IODF.

HCD allows switch configurations to be activated from the active production IODF and other production IODFs. Although keeping the switch matrix separate from the other hardware configuration data in the active production IODF at first seems attractive, it leads to potential confusion as to where the current active switch matrix has been stored.

The conclusion is that production switch configuration data should be kept with other configuration data in the currently active IODF. Switch changes for backup or time-dependent related configuration changes can be activated from the current production IODF. Testing switch configurations may be manipulated using ESCM or non-active production IODFs, whichever is more convenient to the installation.
Chapter 11. HCD Customization

This chapter provides information to assist you to customize HCD. The chapter focuses on:

- HCD invocation
- HCD data set setup considerations
- Tailoring CBDCHCD
- PF Key assignments
- HCD usage recommendations
- Esoteric tokens
- Security considerations

11.1 HCD Invocation CLIST

A sample CLIST, CBDCHCD, is provided in SYS1.SCBDCLST to assist the user in invoking HCD from the ISPF dialog. It allocates the HCD message log file (HCDMLOG), the trace data set (HCDTRACE), the HCD term file (HCDTERM), as well as the HCD data sets:

- SYS1.SCBDPENU -- HCD Panel Library
- SYS1.SCBDMENU -- HCD Message Library
- SYS1.SCBDTENU -- HCD Table Library

It also tailors the ISPF environment by:

- Setting “PFShow on.” This forces all 24 PF keys to be shown.
- Setting lower PF keys as primary function keys.
- Placing the command line at the top of the panel.

The following HCD load library must be allocated prior to invoking HCD:

- SYS1.SCBDHENU

11.2 HCD Data Set Setup Considerations

Prior to running HCD, the ISPF environment for HCD must be established, and the load libraries that contain the HCD modules must be set up correctly. This can be achieved in one of three ways:

- Include SYS1.SCBDHENU in the LNKLSTxx concatenation.
- Include SYS1.SCBDHENU in a JOBLIB or STEPLIB concatenation of the TSO logon procedure.
- Include SYS1.SCBDHENU in the ISPLLIB concatenation. If you choose to access the libraries through the ISPLLIB concatenation, ISPLLIB must be allocated prior to invoking ISPF (using the TSO ALLOC command or through JCL/CLISTs in the TSO logon procedure). ISPLLIB is used as a TASKLIB by ISPF, as it is searched first.

You must also update the logon procedure by adding the following data set to the SYSPROC ddname concatenation:
SYS1.SCBDCLST

**Note:** SYS1.SCBDCLST has a fixed record format (RECFM=FB). If your other SYSPROC data sets have a variable record format (RECFM=V or VB), then copy SYS1.SCBDCLST to a data set with variable record format. Sequence numbers (in the CLIST) must be removed after copying the CBDCHCD to a data set with variable record format.

To invoke HCD, ISPF must be active. Once ISPF has been invoked, you can use the CLIST CBDCHCD to activate the HCD function. Optionally, you may add HCD to an ISPF selection menu and call HCD using the CLIST CBDCHCD. HCD should be added to the ISPF/PDF Master Application Menu (ISP@MSTR). Figure 315 is a sample panel that illustrates how to include HCD on the main ISPF/PDF panel.

```plaintext
%----------------------------------- ISPF MASTER APPLICATION MENU -----------------------------------
%OPTION ++++ ZCMD +USERID - &ZUSER +
% &TIME - &ZTIME
% &TERMINAL - &ZTERM
% &PF KEYS - &ZKEYS
% 1 +ISPF/PDF - ISPF/Program Development Facility
% 2 +SMP/E - System Modification Program/Extended
% 3 +HCD - Hardware Configuration Definition
% 4 +SDSF - SYSTEM Display and Search Facility
% 5 +RACF - Resource Access Control Facility
% X +EXIT - Terminate ISPF using list/log defaults
%
+Enter%END+command to terminate ISPF.
%
)INIT
HELP = ISP00005 /* Help for this master menu */
&ZPRIM = YES /* This is a primary option menu */
)PROC
&ZSEL = TRANS( TRUNC (&ZCMD, ".")
  1,’PANEL(IS@PRIM) NEWAPPL(ISR)’
  2,’PGM(GIMSTART) PARM(&ZCMD) NOCHECK NEWAPPL(GIM)’
  3,’CMD(CBDCHCD) NEWAPPL(CBD) PASSLIB’
  4,’PGM(DGTFMD01) PARM(&ZCMD) NEWAPPL(DGT) NOCHECK ’
  5,’PANEL(ICHPOO) NEWAPPL(RACF)’
  X, ’EXIT’
  *,’?’
)IF (&ZCMD = "%VSDSF")
  &ZSEL = ’PGM(ISFISP) NEWAPPL(ISF)’
)END
```

**Figure 315. Sample ISP@MSTR Panel**

Please note that HCD must be invoked with the NEWAPPL parameter.

To ensure that the HCD CLIST can successfully allocate the following data sets, you must ensure that the following HCD libraries are cataloged:

- SYS1.SCBDPENU
- SYS1.SCBDMENU
- SYS1.SCBDTENU

**Note:** The HCD Panel, Message, and Table libraries are allocated by the CBDCHCD CLIST using the LIBDEF function of ISPF. If other ISPF dialogs are using the LIBDEF function of ISPF, and you do not want HCD to overlay their allocations, you can update your logon procedure by adding the HCD data sets to the ISPF ISPPLIB, ISPMLIB, and ISPTLIB concatenations.
11.3 Tailoring CBDCHCD

The CBDCHCD HCD invocation CLIST allocates the HCD message, trace, and term data sets with a default high level qualifier of the user ID (&SYSUID). If this does not conform to the installation conventions, you may tailor this CLIST to match your installation defaults.

See Appendix A, “HCD Sample CLIST” on page 285 for an example of the CLIST.

11.4 Function Key Assignments

HCD assumes that the terminal supports 24 function keys. If this is not the case, HCD commands can be used for the functions that are assigned to keys PF13 through PF24. The following commands are useful if you are using a 12-PF key keyboard:

- Instruct - PF13
- Left - PF19
- Right - PF20

11.5 HCD Usage Recommendations

HCD supports the ISPF split-screen facility. Thus, you can perform other ISPF operations during an HCD session if necessary. HCD itself cannot be used in two parallel ISPF sessions by the same user.

It is important to note that most of the HCD messages are displayed at the bottom of the screen. This information may not be visible on the screen when operating in “split screen” mode.

11.6 Esoteric Tokens

In an HCD environment, the EDT is dynamically built at IPL time. The esoterics are ordered alphabetically to allow the EDT to be searched more efficiently. When using HCD, data sets that were previously cataloged with an esoteric device group name (for example, SYSDA or SYSALLDA) by use of one of the following methods:

- IDCAMS DEFINE NONVSAM
- IEHPROGM CATALOG

can cause unpredictable results if the data set is accessed through the catalog.

This can be best illustrated with an example.

1. From the EDT List panel, press F11 to add a new EDT. See Figure 316.
2. Add the EDT, then select it from the EDT list panel, and the **Work with esoterics** action from the context menu.

3. Press `F11` to add an esoteric (Figure 317). Add the esoteric FIRST.

4. Repeat the process to add esoterics SECOND, THIRD, FOURTH, FIFTH, SIXTH, SEVENTH, and EIGHTH. These are displayed in alphabetical order on the Esoteric List panel (Figure 318).
At allocation, should a data set allocated to volume group SECOND be required, the EDT index is scanned and it will be determined that the volume group FIFTH (second in the list) should be searched.

If however, the esoterics are changed to include a numeric token ordered in the same sequence as the original esoteric order, then at allocation esoterics are searched in order of the token, and the data set would be found in SECOND. See Figure 319.

Alternatively, it is possible to avoid the problem by re-cataloging data sets with a generic device name (for example 3390).

11.7 Security Considerations

The Resource Access Control Facility (RACF) 1.9 or equivalent is required to control access to data sets required by HCD.

There should be a data set profile for all data sets used by HCD.

To invoke the ACTIVATE function under HCD, a user must be authorized to the MVS.ACTIVATE resource in the OPERCMDS class profile, with a authority of UPDATE. This authorization is also required to switch the IOCDS for the next POR, for example, while writing an IOCDS. The activate function is called implicitly.

Users requiring access only to the test option of the ACTIVATE function should be given READ access to the MVS.ACTIVATE resource.

An alternative method of invoking dynamic configuration changes is using the MVS operator command ACTIVATE from an MCS console. See MVS/ESA SP V5 System Commands for a description of the command syntax.

When an ACTIVATE command is issued, the I/O supervisor calls jobname IEASYSAS, stepname IOSAS to assist in the activate procedure. IOSAS requires
read access to the IODF files. Since the default entry for IOSAS in the Program Properties Table (PPT) is PASS, RACF checking occurs. Message ICH408I is issued after an ACTIVATE IODF=xx command is issued. To ensure that the activate can complete successfully, do one of the following:

- Place the IOSAS task into the RACF started task table (ICHRIN03) and indicate that the user is privileged.
- Define the IODF data sets to RACF with UACC=READ.
- Add IOSAS as an entry in the Started Procedures Table with a valid user ID. This user ID must be granted read access to SYS1.NUCLEUS and the IODF data sets.

Two profiles must also be defined in the FACILITY class to allow you to manage IOCDSs and IPL attributes for a S/390 microprocessor cluster:

**CBD.CPC.IPLPARM** To query and update the IPLADDR and IPLPARM values for IPL.

**CBD.CPC.IOCDS** To query and update IOCDS control information.

Users who need to be able to change these values must be given UPDATE authority. Those requiring only the ability to query the information may be given READ authority.

Two profiles must be defined in the OPERCMDS class to allow you to use the sysplex-wide activate function:

**MVS.DISPLAY.IOS** READ authority to display IOS configuration requests

**MVS.ACTIVATE** UPDATE authority to activate configuration changes

Refer to *MVS/ESA Hardware Configuration Definition: User’s Guide* for more information.
Chapter 12. Other Considerations

12.1 JES3 Considerations

JES3 does not support dynamic reconfiguration of JES3-managed devices. JES3 managed devices may be defined as “dynamic” but any attempt to perform dynamic reconfiguration against them results in a dynamic activation failure; JES3 V4.2.1 APAR OY61674 ‘PINs’ the JES3 managed devices’ UCBs and a ‘PINned’ device cannot be dynamically deleted or modified.

If the device is not JES3-managed (for example, VTAM devices, Sysplex CTCs, SMS managed volumes), dynamic reconfiguration can be performed.

HCD can be used to create input for the JES3 initialization checker from either the work or production IODF. It is recommended that you use the production IODF, as this ensures that the information used for IPL and as a base for the JES3 INISH stream checker match. For instructions on how to create input for the JES3 initialization checker, see 4.6.4, “Creating Input for JES3 Initialization Stream Checker” on page 105.

12.2 Defining OEM Equipment

The following sections provide information on defining unsupported devices and control units.

12.2.1 Unsupported Devices

An unsupported device is one that does not have an installed UIM. If you have to define such a device to your system, you can either write a UIM or define the device as a dummy device to HCD. To define the device as a DUMMY, proceed as follows:

1. Define the CHPID as normal.
2. Define the control unit with a control unit type of DUMMY, being careful to provide the correct I/O currency and protocol information.
3. Define the device with a device type of DUMMY.

During activation, the channel subsystem is updated with the necessary information for the partition to access the dummy device.

12.2.2 Unsupported Control Units

An unsupported control unit in HCD is a control unit that is not defined using a UIM. In addition, OEM control units often require different capabilities than the corresponding IBM control unit (for example, other attachment rules). In these cases, the OEM device supplier should be contacted to provide a UIM defining the control unit with its characteristics. In cases where such a UIM does not exist or will not be provided, HCD allows the definition of a general-purpose control unit called “NOCHECK.” This control unit allows the attachment of any device supported in HCD and can be attached to all types of channels. It supports all protocols and I/O concurrency levels. However, this control unit should be used only as a last resort because it bypasses all validation checks related to control units.
# Chapter 13. HCD: Questions and Answers

This chapter contains a collection of frequently asked questions and their answers as provided by the HCD Development Group.

## 13.1 General Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is HCD, including the migration utility, shipped as part of the MVS/ESA SP BCP?</td>
<td>Yes, HCD is a component of the BCP and does not have to be ordered separately.</td>
</tr>
<tr>
<td>What processors support HCD?</td>
<td>HCD is a component of MVS/ESA SP Version 4 and Version 5; therefore, it can be used on any processor that is ESA-capable. These processors include the ES/4381* Models 91E and 92E, the ES/3090* Models E and above, the ES/9000* processors, and the S/390 microprocessor cluster. HCD runs on any processor capable of running MVS/ESA SP Version 5. Specific functions like coupling facility support or support for new channel types require the corresponding hardware support to be installed.</td>
</tr>
<tr>
<td>What is an IODF?</td>
<td>The I/O Definition File (IODF) is a VSAM linear data set that acts as the repository for configuration definitions as defined through HCD. It is used to define the I/O configuration to both the hardware (by creating the IOCDS) and the software (during IPL).</td>
</tr>
<tr>
<td>What is a work IODF versus a production IODF?</td>
<td>A work IODF’s records are arranged in a logical order to enhance performance using the HCD dialog. The production IODF is read during an MVS/ESA IPL to allow for dynamically creating the UCBs and EDTs. The IODF records must, therefore, be arranged in a format that can be processed by IPL. HCD provides a function to transform a work IODF into a production IODF.</td>
</tr>
<tr>
<td>Will the existing method of using MVSCP to define my I/O configuration continue to be supported after MVS/ESA V4.3?</td>
<td>No. As announced in June 1992, MVS/ESA SP 4.3 is the last MVS/ESA release that supports an MVSCP based IPL.</td>
</tr>
<tr>
<td>If I’m using MVSCP to define my configuration, can I use the dynamic reconfiguration function of MVS V4.3?</td>
<td>No. You must define your I/O configuration using HCD in order to exploit the dynamic reconfiguration function.</td>
</tr>
<tr>
<td>How would I convert my current MVSCP and IOCP input to the HCD process of defining my I/O configuration?</td>
<td>HCD provides a migration facility that takes your MVSCP or IOCP input data sets and converts them into definitions in a work IODF. This work IODF can then be used for further updates and/or to create a production IODF.</td>
</tr>
<tr>
<td>Can I get a hardcopy report of what my I/O configuration looks like?</td>
<td>Yes. HCD provides a report facility that replaces the reports provided by MVSCP and IOCP. These reports are extensive, but can be limited to hardware, software, or a combined configuration report.</td>
</tr>
<tr>
<td>Can I get a graphical report of my configuration?</td>
<td>Yes. HCD provides a graphical report facility that allows you to display and print the graphical layout of the configuration. GDDM is required for this facility. You can use GDDM or BookMaster to print the reports.</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
</tr>
<tr>
<td>----------</td>
<td>--------</td>
</tr>
<tr>
<td><strong>Where does HCD get information on what hardware is supported?</strong></td>
<td>Unit Information Modules (UIMs) are load modules that reside in SYS1.NUCLEUS and define the characteristics of the devices they support to MVS. For HCD, the UIMs contain device information, promptable data from the device perspective, and the device and control unit validation rules. Each of the UIMs also defines the help panels to be displayed along with the contents of the help panels. HCD does provide some standard help information that is used if the UIM does not provide any. In other words, the UIM is responsible for providing all the data HCD needs to drive the dialog. UIMs are provided by the device developer (hardware). The UIMs for a device are shipped with the appropriate device support. Processor modules are provided by HCD and describe the characteristics of the processor like supported channel paths.</td>
</tr>
<tr>
<td><strong>Which devices are supported by HCD?</strong></td>
<td>All devices that are supported by MVS/ESA SP V5.</td>
</tr>
<tr>
<td><strong>Can I use HCD to define my ESCON Director configuration?</strong></td>
<td><strong>Yes.</strong> Starting with HCD Release 3, you can use HCD to define your ESCON Director definitions through HCD. This gives you a single point of control for all hardware configuration activities. Defining your ESCON Director definitions through HCD allows HCD to validate the consistency of switch definitions providing full data path validation. Existing ESCON Director definitions can be migrated into HCD, and HCD can be used to update the ESCON Director definitions based on the information in the IODF.</td>
</tr>
<tr>
<td><strong>I currently use IEHPROGM or IDCAMS (or both) to catalog data sets with esoteric unit names that I define in my configuration. I have read that this technique should not be used when using HCD. What will happen if I continue to do this?</strong></td>
<td>Cataloging data sets using esoteric unit names has been discouraged for some time now. The reason is that part of what makes up the four-byte entry within the catalog is a two-byte relative index of the esoteric unit name within the Eligible Device Table (EDT). This works as long as you do not rearrange esoteric unit names (or insert new esoteric unit names) in your MVS Configuration Program (MVSCP) definitions. With HCD 5.1 you can control the order of the esoteric unit names within the EDT by defining an esoteric token to every esoteric unit name. If, for example, the two-byte index contains X’0005’ assign token 5 to the corresponding esoteric unit name. If you migrate an MVSCP input data set, specify the keyword ESOTERIC_TOKEN = YES in the HCD profile, to assign tokens to all esoteric unit names in the correct order.</td>
</tr>
<tr>
<td><strong>How would you suggest I go about getting familiar with HCD?</strong></td>
<td><strong>MVS/ESA Hardware Configuration Definition: User’s Guide</strong> describes the HCD process. The HCD dialog has a very extensive help facility. The PF1 key is available throughout the dialog to provide information on how to proceed in the dialog. We also recommend reviewing option 10, called Getting started with this dialog from the HCD primary menu. If you are interested in typical definition scenarios, review <strong>MVS/ESA Hardware Configuration Definition: Scenarios</strong>. During the planning phase review <strong>MVS/ESA Hardware Configuration Definition: Planning</strong>.</td>
</tr>
</tbody>
</table>
## 13.2 Setup and Installation Questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
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<tbody>
<tr>
<td>What is an activity log and where does HCD place it?</td>
<td>The activity log is an optional sequential file that is associated with the IODF. Using the activity log allows the user to keep track of changes made to the configuration. The function is optional, but is recommended for tracking changes made to the system. If DFSMS is not used to manage data sets, the data set is dynamically allocated by HCD using the default unit parameter, which can be defined by the user either using an UADS entry or the ALLOCxx member of SYS1.PARMLIB.</td>
</tr>
<tr>
<td>Is it possible to tailor HCD supplied defaults and processing options to my specific installation needs?</td>
<td>Yes. Before you start HCD, you can define an HCD profile that allows you, for example, to specify the colors and layout of the graphical report, or some migration defaults, as well as several other processing options.</td>
</tr>
<tr>
<td>What is the reason for requiring access to SYS1.NUCLEUS when using the HCD dialog?</td>
<td>This is no longer a requirement. If all UIMs reside in SYS1.NUCLEUS, HCD allocates the data set dynamically. If some or all UIMs reside in other data sets, specify the keyword UIM_LIBNAME in the HCD profile to inform HCD which data sets to allocate. Keep in mind that the UIMs are used during IPL to build the UCBs. This is the reason the UIMs should reside in SYS1.NUCLEUS.</td>
</tr>
<tr>
<td>I want to create hardware definitions for multiple processors. Do I create one IODF or several?</td>
<td>It is up to you to decide whether to create one IODF for each processor or to combine the I/O definitions for two or more processors in a single IODF. In the case of two or more processors with shared devices, an advantage of maintaining the I/O configurations for both in one IODF is the fact that information for shared devices has to be entered only once. A second reason to consider maintaining I/O configurations for multiple processors in one IODF is that it allows you to download multiple IOCDSs in a S/390 microprocessor cluster or to dynamically activate multiple configuration changes in a sysplex. In a coupling facility environment it is required to define all processors in one IODF. Otherwise you cannot connect CFS and CFR channel paths from different processors. When you connect CFS and CFR channel paths, HCD generates CFS control units and devices as required for the channel subsystem.</td>
</tr>
<tr>
<td>Are there any upper limits to the number of processors that are supported?</td>
<td>There is no practical limit to the number of processors or configurations you can define; however, a limit, which can be increased by the user, has been set to 4096.</td>
</tr>
<tr>
<td>Is the number of IODFs limited?</td>
<td>The number of IODFs is not limited. Limitations exist as a consequence of catalog constraints and available disk space.</td>
</tr>
<tr>
<td>How large, as in number of devices, can an IODF be?</td>
<td>There is no limit to the number of devices you can define through HCD within an IODF; instead, the constraints would be as a result of the size of the given IODF.</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
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<tr>
<td>If you have multiple MVS systems running under VM, how would these</td>
<td>You have several alternatives:</td>
</tr>
<tr>
<td>systems be defined to HCD?</td>
<td>• You can define the entire configuration using one processor and then define one operating system used by all MVS systems during IPL.</td>
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<td></td>
<td>• You can define each MVS image as a separate entity (processor and operating system), all within the same IODF.</td>
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<tr>
<td></td>
<td>• Any combination of these two alternatives.</td>
</tr>
<tr>
<td>Note: Devices shared across systems need only be defined once.</td>
<td></td>
</tr>
<tr>
<td>What about defining several MVS systems running under PR/SM?</td>
<td>HCD fully supports PR/SM in being able to define several MVS images running natively. This is done by defining one processor with the control units and devices attached to the processor. Duplicate device numbers are supported. In fact, you can define two devices with device number 100, where the first device is a 3490 Tape and the second one is a 3390 DASD, as long as each device is connected to a different partition.</td>
</tr>
<tr>
<td></td>
<td>After defining the processor (channel subsystem), you would then define one or more operating systems running in the various partitions. The decision as to how many operating systems to define depends on the symmetries of the configuration. If each partition has the same set of devices with the same device numbers, then you need only one operating system. On the other hand, if different sets of devices or device types are defined for the various partitions, then you need multiple operating systems defined; one for each set.</td>
</tr>
<tr>
<td>If I’m running a mixed environment with VM and MVS, can I use HCD to</td>
<td>Yes. HCD allows you the definition of VM operating systems and I/O configurations. Thus, you can define the entire configuration in one IODF. HCD provides a function that allows you to create an HCPRI0 input data set based on the definitions in the IODF.</td>
</tr>
<tr>
<td>define my configuration?</td>
<td></td>
</tr>
<tr>
<td>I have created my IODF using an earlier release of HCD. Can I</td>
<td>Yes. You first have to upgrade the IODF to the new format. HCD includes a function that allows you to upgrade IODFs created under previous releases of HCD to the new format required by HCD 5.2.</td>
</tr>
<tr>
<td>continue to use the IODF with HCD 5.2?</td>
<td></td>
</tr>
<tr>
<td>Can I use HCD on a central system to define the configuration for</td>
<td>Yes. On a central system you can define IODFs for various remote systems. You can either share the IODF between multiple systems, or distribute the IODF to other systems using the export/import function, provided by HCD.</td>
</tr>
<tr>
<td>another remote system?</td>
<td>You can download IOCDSs to all CPCs in a S/390 microprocessor cluster, and you can activate configuration changes within a whole sysplex, using one central HCD.</td>
</tr>
<tr>
<td>Can I create IODFs in a DFSMS environment?</td>
<td>Yes. The specification of a VOLSER is optional when operating in a DFSMS environment. But keep in mind that the production IODF to be used for IPL must reside on a specific volume together with the SYSn.IPLPARM data set.</td>
</tr>
<tr>
<td>Where do I specify the name of the IODF to be used for IPL?</td>
<td>An initialization member, LOADxx, is used to specify the IODF and the configuration to be used during IPL. This LOADxx member may reside in SYS1.PARMLIB or in SYSn.IPLPARM. The LOADPARM field of the system console OPRCTL or SYSCTL frame is used to specify the location and suffix of the library containing the LOADxx member.</td>
</tr>
</tbody>
</table>

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## 13.3 Usage Questions

<table>
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<tr>
<th>Question</th>
<th>Answer</th>
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<tbody>
<tr>
<td>Is there a place where you can include comments relative to an object (for example, processors, control units, and devices)?</td>
<td>There is a 32-byte description field available for each object (such as a processor or a channel path) displayed in the action list. For example, this field can be used to document changes (that is, change control) to the object. Another example would be information about the location of the object (such as building and room number).</td>
</tr>
<tr>
<td>Is there a way to limit the number of objects being displayed?</td>
<td>The filter function provides a way of limiting the display to a subset of the total. The filter acts on specific object criteria, for instance, object type, description, or serial number. Generic notation, using the asterisk as a ‘wild card’ character (for example, ‘33**ssq.’), is also supported.</td>
</tr>
<tr>
<td>Can you query information in the description field?</td>
<td>Filtering on information in the object description field is allowed; for example: ‘ROOM 109’.</td>
</tr>
<tr>
<td>How can you find a specific definition in an action list of objects?</td>
<td>The Locate command is available and can be used to search for a specific object identifier within a list; for example, control unit number, device number, channel path ID.</td>
</tr>
<tr>
<td>How do I find an explanation for a displayed message?</td>
<td>HCD uses the concept of online help, which includes online messages. While the message is displayed, an explanation for the message and user action information is available by pressing PF1. The format used is similar to the format used in typical message manuals. A separate message manual includes all HCD messages.</td>
</tr>
<tr>
<td>Where do I find information about what can be configured and how the configuring can be done using HCD?</td>
<td>The HCD Query function displays a list of all supported processors, switches, control units, device types, and object specific information such as the number of channel paths for a processor. This information can be printed, and can be used for planning purposes prior to defining the configuration. Device features and parameters, valid for a specific device type, are listed only when actually defining the device to the operating system.</td>
</tr>
<tr>
<td>How do I know what to enter in an input field?</td>
<td>There are two ways:</td>
</tr>
<tr>
<td></td>
<td>• Help is available for all input fields. The information is available by using the PF1 key while the cursor is positioned in the input field.</td>
</tr>
<tr>
<td></td>
<td>• Many input fields are also provided with the HCD Prompt function. To use this function, place the cursor in the input field and press PF4. A pop-up list of valid entries (syntax, semantics) is displayed. To select an entry, place the cursor in front of it and press Enter. The selected entry is then automatically placed into the input field.</td>
</tr>
<tr>
<td>Why would I get error messages when migrating IOCP or MVSCP decks into HCD?</td>
<td>HCD does a more rigorous verification of the definitions than the IOCP or MVSCP programs do, which may cause errors to occur. Examples of input that generate an error are:</td>
</tr>
<tr>
<td></td>
<td>• Invalid specification of protocol for a control unit type</td>
</tr>
<tr>
<td></td>
<td>• Invalid pairing of control unit type and device type</td>
</tr>
<tr>
<td></td>
<td>• Duplicate labels within an IOCP input data set</td>
</tr>
<tr>
<td></td>
<td>This validation is performed by HCD to ensure that the configuration is valid and error-free. It is recommended to use the validate option before you save the input.</td>
</tr>
</tbody>
</table>
### 13.4 IOCP and IOCDS Download Support

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
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</thead>
<tbody>
<tr>
<td><strong>How can I find out the differences between two IODFs?</strong></td>
<td>HCD has a function that compares two IODFs and reports the differences. This compare function can be limited to a pair of processor definitions, of switch definitions, and of operating system definitions. You can also compare the device definitions of an OS configuration with the channel subsystem definitions for a particular processor (or partition if the processor is running in LPAR mode).</td>
</tr>
<tr>
<td><strong>Can I use HCD to download an IOCDS for a processor that is running VM?</strong></td>
<td>Yes. Comparable parameters that are used in the HCPRIO input data set should be used when defining the configuration in HCD, which is the same requirement that existed for running IOCP under VM.</td>
</tr>
<tr>
<td><strong>Why doesn’t HCD support the STADET parameter specified in an existing IOCP input data set?</strong></td>
<td>HCD does support the STADET parameter for those processors that support the status detection feature.</td>
</tr>
<tr>
<td><strong>Why must I switch to a production IODF to build the IOCDS?</strong></td>
<td>Unlike work IODFs, a production IODF cannot be accidentally changed. This preserves the integrity of the IODF and ensures that the IOCDS always matches a known IODF level. Additionally, only production IODFs have tokens, which are required as input to the IOCP program, when planning to use the dynamic reconfiguration function.</td>
</tr>
<tr>
<td><strong>How does HCD know which IOCP version to use for downloading an IOCDS?</strong></td>
<td>The appropriate processor module provides HCD with the information about whether to invoke IXPIOCP or IZPIOCP.</td>
</tr>
<tr>
<td><strong>IOCP validates the input data set before it downloads the IOCDS. Does HCD guarantee that the defined configuration is accepted by IOCP?</strong></td>
<td>Yes. HCD performs even a more rigorous validation than the IOCP program does. Using IOCP to download an IOCDS, you still might run into problems during POR. You can avoid these problems when using HCD to download the IOCDS.</td>
</tr>
</tbody>
</table>
| **How can I control which IODF was used to download the IOCDS?**         | 1. When you download an IOCDS, you can specify two descriptor fields to identify the IOCDS. These descriptor fields contain the IODF name per default, and can be displayed at the hardware console as well as using HCD.  
2. When you download an IOCDS, HCD writes a time stamp to the production IODF. Later on you can identify which IOCDS was downloaded when, if you display the IOCDS List panel.  
3. You can display the processor token of each processor defined in a production IODF as well as the hardware configuration token stored in the IOCDS. If both tokens match, you have found the processor definition that was downloaded. |
### 13.5 HCD and Dynamic Reconfiguration

<table>
<thead>
<tr>
<th>Question</th>
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<tbody>
<tr>
<td>Where does HCD relate to the Dynamic I/O Configuration feature of MVS/ESA SP Versions 4 and 5?</td>
<td>The I/O configuration must be defined through HCD in order to perform a dynamic I/O reconfiguration task. Additionally, HCD provides a front-end to the activation process.</td>
</tr>
</tbody>
</table>
| When using the migration utility under HCD, what is the Dynamic attribute of I/O devices initially set to - STATIC or DYNAMIC? | The UIM defines whether a device is dynamic-capable and also defines the default value. This value can be either YES or NO; that is, whether the device is by default “installation static” or “dynamic.”  
  The HCD migration function sets the initial value to “not determined,” which is treated as “installation static,” to allow the user to change it later.  
  There is an HCD function, “Attribute group change,” that allows the user to change the DYNAMIC parameter for a large number of devices with one action. |
| What is the nature of the requirement for RACF 1.9, when using HCD that is shipped with MVS/ESA SP Version 4.2.x and later? | RACF is required to authorize use of the Activate function from HCD.  
  IOS ensures that the user has the appropriate authorization for the MVS.ACTIVATE resource in the OPERCMDS class. Read access is sufficient for the Activate Test function, whereas Update access is required for all other Activate functions. If this resource is not available, then the Activate is not permitted.  
  RACF is not required when using the operator ACTIVATE command; thus, dynamic I/O reconfiguration is available even if RACF, or a similar product, is not installed. |
| Many devices are shared among all MVS systems within a sysplex. If I change the configuration, how can I activate the changes for all MVS systems and CPCs? | The function sysplex-wide activate is the answer to your question. You can activate the changes for multiple MVS systems and CPCs from the Active Sysplex Member List panel. |
Appendix A. HCD Sample CLIST

This appendix contains the sample CLISTs provided as part of HCD. Both CLISTs, CBDCHCD and CBDCHCD1 are shipped with the product. CBDCHCD invokes CBDCHCD1, which invokes the HCD main program CBDMGHCP with appropriate invocation parameters.

A.1 CBDCHCD

/**************************************************************************/
/* */
/* MODULE NAME = CBDCHCD */
/* */
/* DESCRIPTIVE NAME = MVS/HCD CLIST */
/* */
/* PROPRIETARY STATEMENT = */
/* */
/* LICENSED MATERIALS - PROPERTY OF IBM */
/* THIS CLIST IS “RESTRICTED MATERIALS OF IBM” */
/* 5655-068 (C) COPYRIGHT IBM CORP. 1990, 1994 */
/* */
/* STATUS = HCSH521 */
/* */
/* FUNCTION = Invokes MVS/HCD clist CBDCHCD1 */
/* */
/* MODULE TYPE = CLIST */
/* */
/* DEPENDENCIES = None */
/* */
/* RESTRICTIONS = None */
/* */
/* PROCESSOR = */
/* */
/* INVOCATION = */
/* */
/* */
/**************************************************************************/
PROC 0 TRACE(NO) TEST

/**************************************************************************/
/* CLIST to be shipped with HCD to invoke HCD under a system */
/* installed with SMP/E */
/* Note: - The TRACE facility is set to 'NO' by default */
/* */
/**************************************************************************/
IF ( &TEST = TEST ) THEN DO
   CONTROL LIST, CONLIST, NOFLUSH, SYMLIST, MSG
   SET MSG = MSG
END
ELSE DO
   SET MSG = NOMSG
CONTROL NOLIST, NOCONLIST, NOFLUSH, NOSYMLIST, NOMSG
END

SET &PARM = &STR(DIALOG,E)
IF &TRACE = YES THEN - 
  SET &PARM = &STR(TRACE,DIALOG,E)

/***************************************************************/
/* */
/* Allocate all HCD files */
/* */
/* NOTE: Load libraries containing HCD modules */
/* must be concatenated as ISPLLIB before user */
/* invokes this CLIST */
/* */
/* ***************************************************************/

/*/ Allocate Panel library */
ISPEXEC LIBDEF ISPPLIB DATASET ID(′SYS1.SCBDPENU′)
/*/ Allocate Table library */
ISPEXEC LIBDEF ISPTLIB DATASET ID(′SYS1.SCBDTENU′)
/*/ Allocate Message library */
ISPEXEC LIBDEF ISPMLIB DATASET ID(′SYS1.SCBDMENU′)

/***************************************************************/
/* Delete Message Log File */
/***************************************************************/
DEL ′&SYSUID..HCD.MSGLOG′ PURGE

/***************************************************************/
/* Allocate Message Log File */
/***************************************************************/
IF &SYSDSN(′&SYSUID..HCD.MSGLOG′) = OK THEN +
  DO
    ALLOC F(HCDMLOG) DA(′&SYSUID..HCDMSGLOG′) REUSE SHR
  END
ELSE +
  DO
    ALLOC F(HCDMLOG) DA(′&SYSUID..HCD.MSGLOG′) SPACE(5,10) +
    BLKSIZE(1330) LRECL(133) RECFM(F B) BUFNO(2) OUTPUT
  END
IF &LASTCC > 0 THEN +
  WRITE HCD Message Log File could not be allocated !

/***************************************************************/
/* Allocate Trace File */
/***************************************************************/
IF &SYSDSN(′&SYSUID..HCD.TRACE′) = OK THEN +
  DO
    ALLOC F(HCDTRACE) DA(′&SYSUID..HCD.TRACE′) REUSE SHR
  END
ELSE +
DO
ALLOC F(HCTRACE) DA(′&SYSUID..HCD.TRACE′) SPACE(20,20) +
BLKSIZE(6160) LRECL(80) RECFM(F B) BUFNO(2) OUTPUT
END
IF &LASTCC > 0 THEN +
WRITE HCD Trace Dataset could not be allocated !

/************************************************************/
/* Allocate Term File */
/************************************************************/
IF &SYSDSN(′&SYSUID..HCD.TERM′) = OK THEN +
DO
ALLOC F(HCDTERM) DA(′&SYSUID..HCD.TERM′) REUSE SHR
END ELSE +
DO
ALLOC F(HCDTERM) DA(′&SYSUID..HCD.TERM′) SPACE(5,10) +
BLKSIZE(1600) LRECL(80) RECFM(F B) BUFNO(2) OUTPUT
END IF &LASTCC > 0 THEN +
WRITE HCD Term File could not be allocated !

/************************************************************/
/* Save contents of Profile pool */
/************************************************************/
ISPEXEC VGET ZPFSHOW PROFILE IF &LASTCC = 0 THEN +
SET &SZPFSHOW = &ZPFSHOW
ISPEXEC VGET ZPFCTL PROFILE IF &LASTCC = 0 THEN +
SET &SZPFCTL = &ZPFCTL
ISPEXEC VGET ZPFMT PROFILE IF &LASTCC = 0 THEN +
SET &SZPFMT = &ZPFMT
ISPEXEC VGET ZPRIKEYS PROFILE IF &LASTCC = 0 THEN +
SET &SZPRIKEYS = &ZPRIKEYS
ISPEXEC VGET ZKEYS PROFILE IF &LASTCC = 0 THEN +
SET &SZKEYS = &ZKEYS
ISPEXEC VGET ZPFSET PROFILE IF &LASTCC = 0 THEN +
SET &SZPFSET = &ZPFSET
ISPEXEC VGET ZPLACE PROFILE IF &LASTCC = 0 THEN +
SET &SZPLACE = &ZPLACE

/************************************************************/
/* Call CLIST CBDCHCD1 which invokes the HCD mainline */
/************************************************************/
ISPEXEC +
   SELECT CMD('%CBDCHCD1 &TEST TRACE(&TRACE)) +
      NEWAPPL(CBD) PASSLIB

/************************************************************/
/* Restore contents of Profile Pool */
/************************************************************/

SET &ZPFCTL = &SZPFCTL
ISPEXEC VPUT ZPFCTL PROFILE
ISPEXEC SELECT PGM(ISPOPF) PARM(PFK,&SZPFSHOW)

SET &ZPFMT = &SZPFMT
ISPEXEC VPUT ZPFMT PROFILE

SET &ZPRIKEYS = &SZPRIKEYS
ISPEXEC VPUT ZPRIKEYS PROFILE

SET &ZKEYS = &SZKEYS
ISPEXEC VPUT ZKEYS PROFILE

SET &ZPFSET = &SZPFSET
ISPEXEC VPUT ZPFSET PROFILE

SET &ZPLACE = &SZPLACE
ISPEXEC VPUT ZPLACE PROFILE

/************************************************************/
/* Frees datasets which have been allocated */
/************************************************************/
FREE F(HCDTRACE HCDMLOG HCDTERM)

/************************************************************/
/* Frees Panel, Table and Message library */
/************************************************************/
ISPEXEC LIBDEF ISPPLIB
ISPEXEC LIBDEF ISPTLIB
ISPEXEC LIBDEF ISPMLIB
EXITS

288  HCD Primer
**A.2 CBDCHCD1**

```plaintext
/* MODULE NAME = CBDCHCD1 */
/* DESCRIPTIVE NAME = MVS/HCD CLIST */
/* PROPRIETARY STATEMENT = */
/* LICENSED MATERIALS - PROPERTY OF IBM */
/* THIS CLIST IS "RESTRICTED MATERIALS OF IBM" */
/* 5655-068 (C) COPYRIGHT IBM CORP. 1990, 1994 */
/* STATUS = HCSH521 */
/* FUNCTION = INVOKES MVS/HCD MAINLINE CBDMGHCP */
/* MODULE TYPE = CLIST */
/* DEPENDENCIES = NONE */
/* RESTRICTIONS = NONE */
/* PROCESSOR = */
/* INVOCATION = INVOKED BY CLIST CBDCHCD */
/* CHANGE ACTIVITY = */

PROC 0 TRACE(&TRACE) TEST

IF ( &TEST = TEST ) THEN DO
    CONTROL LIST, CONLIST, NOFLUSH, SYMLIST, MSG
    SET MSG = MSG
END
ELSE DO
    SET MSG = NOMSG
    CONTROL NOLIST, NOCONLIST, NOFLUSH, NOSYMLIST, NOMSG
END
```

Appendix A. HCD Sample CLIST 289
SET &PARM = &STR(DIALOG,E)
IF &TRACE = YES THEN -
   SET &PARM = &STR(TRACE,DIALOG,E)

/***************************************************************************/
/* Set Variables for PF key setting and other ISPF options */
/* needed for HCD */
/***************************************************************************/

ISPEXEC VGET ZPFFMT PROFILE /* displays 6 PF keys per line */
IF &LASTCC = 0 OR &LASTCC = 8 THEN +
   SET &ZPFFMT = SIX /* @P1*/
ISPEXEC VPUT ZPFFMT PROFILE

ISPEXEC VGET ZPFCTL PROFILE /* enables PFSHOW command */
IF &LASTCC = 0 OR &LASTCC = 8 THEN +
   SET &ZPFCTL = USER /* @P1*/
ISPEXEC VPUT ZPFCTL PROFILE
ISPEXEC SELECT PGM(ISPOPF) PARM(PFK,ON) /* issues PFSHOW ON */

ISPEXEC VGET ZPFSET PROFILE /* sets ALL PF keys shown */
IF &LASTCC = 0 OR &LASTCC = 8 THEN +
   SET &ZPFSET = ALL /* @P1*/
ISPEXEC VPUT ZPFSET PROFILE

ISPEXEC VGET ZPRIKEYS PROFILE /* low keys as primary keys */
IF &LASTCC = 0 OR &LASTCC = 8 THEN +
   SET &ZPRIKEYS = LOW /* @P1*/
ISPEXEC VPUT ZPRIKEYS PROFILE

ISPEXEC VGET ZKEYS PROFILE /* forces all 24 keys to be shown */
IF &LASTCC = 0 OR &LASTCC = 8 THEN +
   SET &ZKEYS = 24 /* @P1*/
ISPEXEC VPUT ZKEYS PROFILE

ISPEXEC VGET ZPLACE PROFILE /* PLACES COMMAND LINE */
IF &LASTCC = 0 OR &LASTCC = 8 THEN +
   SET &ZPLACE = ASIS /* @L3*/
ISPEXEC VPUT ZPLACE PROFILE

/***************************************************************************/
/* Call HCD mainline */
/***************************************************************************/

ISPEXEC +
   SELECT PGM(CBDMGHCP) +
   PARM(&PARM) NEWAPPL(CBD) PASSLIB

END
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